ELECTRICAL WORLD

A consolidation of Electrical World, Electrical Engineer and American Electrician

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What in the World!

"—— could you and I with Him conspire
To grasp this sorry scheme of things entire
Would we not shatter it to bits—and then
Remold it nearer to the Heart's Desire?"

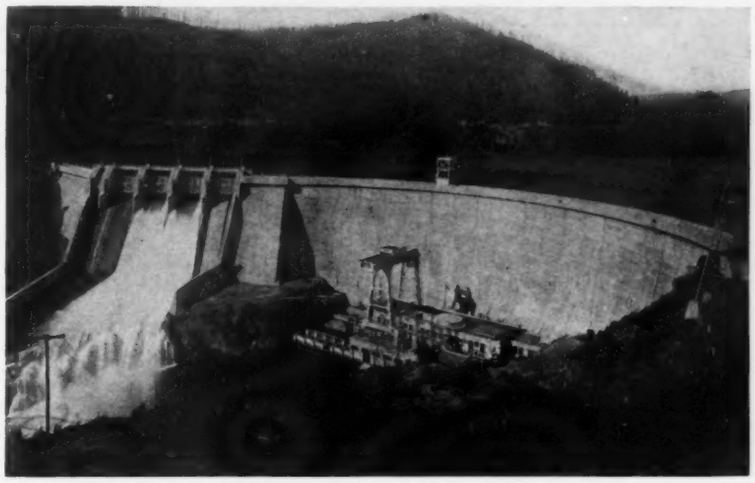
How warmly does the sorely-tried world of business, finance, engineering and men and women wish with Omar that bygones might be bygones and the all-too-insistent present made a glamorous future? . . . today. But the way of humanity has ever been the way of muddling through. Bank holidays, heart-rending depression, unemployment and shattered dreams are mended by curative processes of essential slowness.

●

We have no evangelistic Heaven or Hell to offer for anyone's troubles, much less our own, but the signs of the times do point an unmistakable lesson and conclusions may logically be drawn as to how to set the course. Manufacturers, for example, want profits above the lightening of ship which staves off disaster. Today both sales and manufacturing costs prevent profits, and it appears that improved methods and organizations together with trade association efforts constitute the only reasonable "out" (p. 316).

●

Samuel Ferguson of Hartford, irrepressible and unconventional director of the destinies of a utility property which, if for nothing else, would be notable for its complete freedom from funded indebtedness, mercury turbine pioneering, consumers' dividends, relief for the jobless customer and unparalleled customer and commission confidence, has added yet another courageous idea, range rentals, and here is how he does it (p. 324).



Ariel development, Inland Power & Light Company

MARCH 11, 1933

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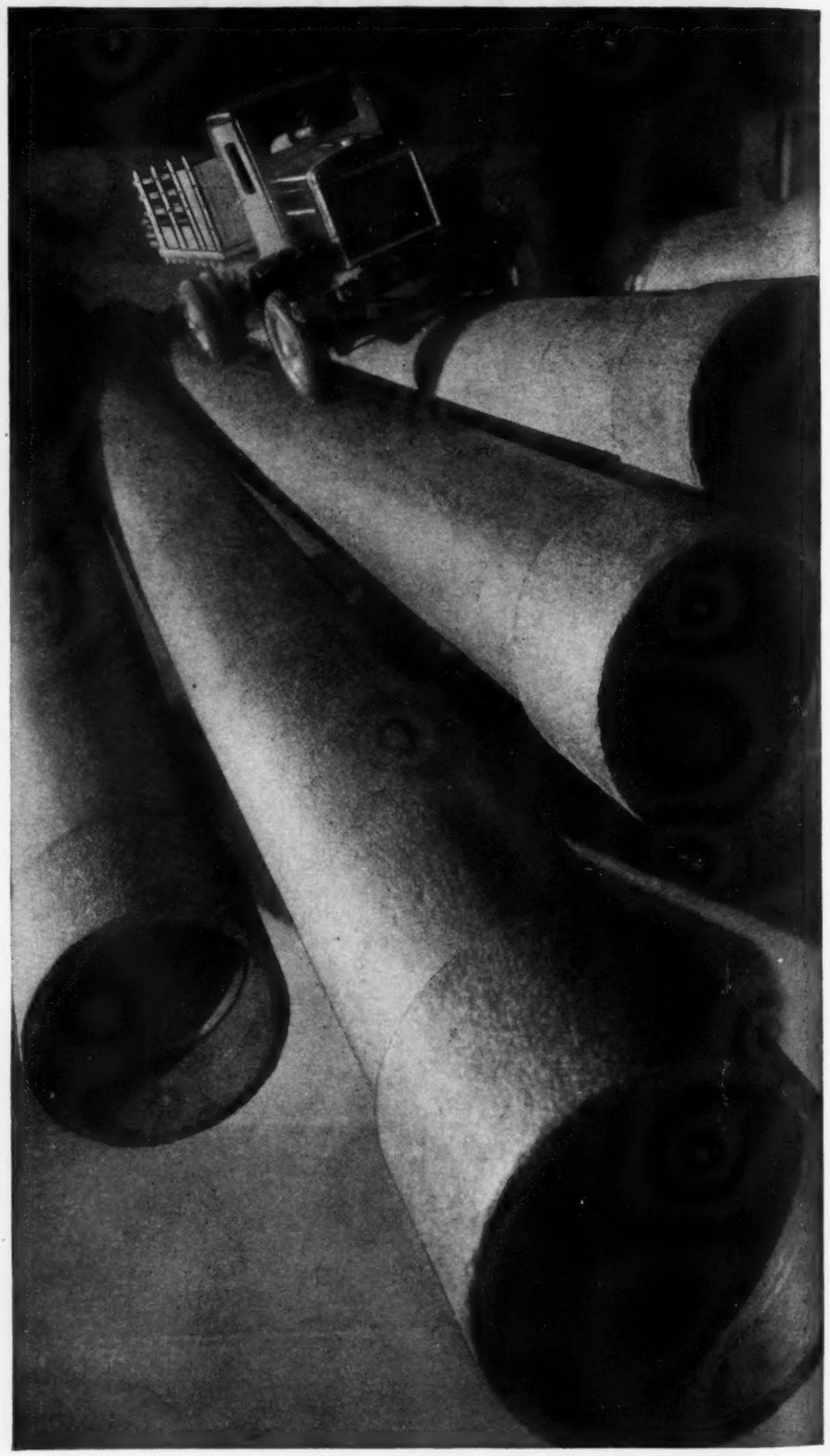

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ELECTRICAL WORLD

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for the Week Ending

March 11, 1933

Utilities Meet Bank Emergency

PUBLIC utility companies throughout the country reported no contraction of service since the inauguration of the banking holidays, restrictions and limitations and only a small contraction in payment of customer bills. Few operating companies were forced during the past week to call upon the parent holding company to ship funds in large amounts from New York and other financial centers to meet pay-rolls and other expenses. Where requests were received transfers were made either through banks, telegraph or mail.

It was stated at the offices of several of the large companies that should the holidays or moratoriums be extended over a long period they were ready to respond with sufficient cash.

Sufficient funds

The Commonwealth & Southern Corporation has already sent a small amount of cash to a few of its subsidiaries already affected and stands ready to come to the assistance of all of its subsidiary companies should there be any need. The same is true of the American Water Works & Electric Company, which reported cash of $3,616,993 at the close of the year.

The American Gas & Electric Company has several properties in Ohio and Indiana and while no funds in large amounts have been sent to the interior, the company has sufficient funds to meet any demands.

It was stated at the offices of Electric Bond & Share Company that it has sufficient cash on hand to supply the needs of its subsidiaries in case of a shortage of funds due to the temporary closing of banks.

Detroit Edison Company has been able to get sufficient cash to meet pay-rolls and to cash employees' checks through New York connections.

Cities Service Company and the Associated Gas & Electric Company reported that there has been no call for cash from the subsidiary companies, although they stood ready to meet the demands.

The utility companies in many of the communities affected by the present bank situation have responded with aid and are meeting pay-rolls and miscellaneous expenditures. Several companies have reported that they will cash pay-roll checks of the employees. Utility companies have announced that there will be no discontinuance of service due to non-payment of bills and the regular discount allowed for prompt payment of bills will remain good until the bank situation clears.

In some instances utility commissions have issued orders to utilities not to cut off service for non-payment of bills. The Alabama Public Service Commission issued the following order:

"For those customers who are unable to pay their bills, all utilities and telephone companies shall suspend enforcement of the rules governing cutoff of service for non-payment and forfeiture of discounts for failure to pay for service accounts within the prescribed period."

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P.S.C. Investigators Ask High Court Ruling

Maintaining that the investigation of public utilities in the state of Pennsylvania had not been terminated, Senator John J. McClure, chairman of the investigating committee, stated that court orders have made a recess necessary. Senator McClure said that the committee has been informed by its counsel that it is impossible for it to continue its inquiry before the Supreme Court rules on the injunctions which stopped public hearings early in December.

The committee's counsel are fighting the court orders, and the committee members are studying proposed changes in the public service laws to give the Public Service Commission wider powers in regulating utility companies. Attorneys for the committee have filed answers to all of the temporary writs issued by the courts and it is expected that dates soon will be set for arguments. Until the Supreme Court rules on the powers of the committee, which also affect the authority of any legislative investigating committee, the public hearings cannot be resumed, Mr. McClure said counsel advised.

Disagreeing with assertion of Dr. Clyde L. King, chairman of the Public Service Commission, that an inquiry into the activities of the commission was not needed (ELECTRICAL WORLD, March 4, page 276), Democratic House members, headed by Warren Van Dyke, demanded that the legislature continue the investigation. "The General Assembly cannot afford to back down," Mr. Van Dyke said, "regardless of what Dr. King says. The honor of Pennsylvania is at stake . . . I believe that every rate payer in Pennsylvania feels as I do when I assert there should be a full, fair and free investigation of the entire utility situation. . . ."

Following a stormy session of the committee this week Oliver K. Eaton, chief counsel, submitted the resignations of himself and two associates, but at the conclusion of a long executive session held later it was indicated that the committee was seeking to placate Mr. Eaton and that he might be continued as legal guide to the investigators. The action of Mr. Eaton was the culmination of his insistence that the investigators resume their work at the point where it ceased last year.

"I am not surprised that Mr. Eaton resigned," delared Governor Pinchot. "He wanted a full investigation, but the committee would not give it to him. I shall have something further to say on utilities in a special message to the Legislature later."

Bankers Reduce Middle West Interest Rate

SAVINGS of $273,000 annually in the amount of interest paid on the secured debt of Middle West Utilities Company was accomplished this week as a result of negotiations carried on with bankers by Edward N. Hurley and Charles A. McCulloch, receivers of Middle West Utilities Company.

Messrs. Hurley and McCulloch, in a petition filed with Judge Walter C. Lindley in the United States District Court, pointed out that owing to a reduction in the income from the collateral pledged with bankers the receivers of Middle West Utilities Company had obtained agreement from the former to reduce the rate of interest being paid on collateral loans of Middle West Utilities Company to 4 per cent.

This results in a reduction in the amount of annual interest from $1,395,000 being paid at present to $1,122,000 henceforth, or an annual saving to the receivership of $273,000. By reducing the aggregate amount of interest paid to a figure more nearly approximating the annual income from the collateral pledged there is left available for other creditors and general purposes the bulk of the income received from unpledged securities owned by Middle West.

The secured creditors who have assented to the reduction in interest rate include First National Bank of Chicago; Continental Illinois National Bank & Trust Company, Chicago; Central Republic Trust Company, Chicago; Halsey Stuart & Company, Inc., Bankers Trust Company, New York, and two operating subsidiaries of Middle West Utilities Company, viz.: Kansas Electric Power Company and Kentucky Utilities Company.

Bigelow appointed trustee

Garfield Charles, referee in bankruptcy, appointed Harry A. Bigelow, dean of the Law School of the University of Chicago, as trustee for Insull Utility Investments.

The appointment followed the disqualification of two trustees whose elections were obtained by Harold P. White and Lewis F. Jacobson, lawyers, holding power of attorney for a debenture holders protective committee.

Judge James H. Wilkerson's order invalidating the election of W. W. Wheelock as trustee directed the referee to ignore their power of attorney at creditors' elections. The judge declared the appointment of Dean Bigelow "excellent."

Federal Judge James H. Wilkerson has set March 28 for trial as to whether or not Middle West Utilities Company shall be adjudicated bankrupt.

The action came as a compromise to the request of Lewis F. Jacobson, attorney for the petitioning creditors of the company, who asked authority to examine officers and directors of Middle West under section 21A of the bankruptcy act.

Attorney Lewis F. Jacobson, whose petition for bankruptcy has been before the court since last April, made the first plea that the question of Middle West solvency be adjudicated. He was joined by Attorney Robert N. Golding of counsel for a committee representing the holders of $40,000,000 of Middle West notes.

Would quiz bankers

"We want to question the bankers who took the securities of this company for collateral on loans," said Mr. Jacobson. "We want to show that this company was insolvent last April and thereby lay the ground for recovery of all collateral pledged within four months prior to its insolvency."

Attorney Orville J. Taylor, representing the common-stock holders, opposed Mr. Jacobson's plea. A hearing in bankruptcy would serve no useful purpose, he contended.

Disregarding Mr. Taylor's plea the judge announced he would assign the case to Master Grossman. He set March 28 for a hearing in his own court at which he will determine whether, on the basis of the evidence before the master, the company is actually insolvent.

Collateral sale postponed

Auction of collateral of Insull Utility Investments, Inc., and Corporation Securities Company of Chicago held by New York banks has been postponed until noon March 15.

Auction of Middle West Utilities Company common stock held by Central Hanover Bank and Trust Company and Guaranty Trust Company of New York as collateral on loans of Insull Utility Investments, Inc., and Corporation Securities Company of Chicago has been postponed until 3 p.m. March 15.

New men on boards

Last week Commonwealth Edison added to its directorate L. E. Block, chairman of the board of Inland Steel; Joseph M. Cudahy, member of the packing family; Thomas E. Donnelley, president R. R. Donnelley & Sons, and Albert H. Wetten, president Albert H. Wetten & Company.

Peoples Gas chose as new directors Sewell L. Avery, chairman of the board, Montgomery Ward & Company, and president U. S. Gypsum Company; Howard W. Fenton, president Harris Trust & Savings Bank; Charles B. Goodspeed, manufacturer; Donald R. McLennen, head of Marsh & McLennan, insurance, and Melvin A. Traylor, president First National Bank of Chicago.

Public Service has the following new directors: John T. Pirie, president Carson Pirie Scott & Company; Joseph H. King, president National Regulator Company; John J. Mitchell and James Simpson, chairman of the company.

George A. Ranney, vice-president of the International Harvester Company, will become vice-chairman of the three operating utility companies on or about May 1. This was announced by James Simpson, chairman, and the boards of the corporations, the Commonwealth Edison Company, Peoples Gas, Light & Coke Company and Public Service Company of Northern Illinois.

Mr. Ranney will take the offices made vacant recently by the resignation of Samuel Insull, Jr. He has resigned from International Harvester.

At the meeting of the boards of the three companies Mr. Simpson was re-elected chairman. All the directors also were re-elected.

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Scope of Edison Institute Defined at Boston Meeting

Pointing out to New England utility engineers at a Boston meeting last week that the new Edison Electric Institute is being organized to function on a national rather than a regional basis, Alexander Maxwell, director of engineering at New York headquarters, declared that as yet no provision has been made for affiliation with geographic area organizations, although a "lively and sympathetic liaison with such bodies is regarded as highly desirable."

Mr. Maxwell said that economy was the chief consideration in organizing this new trade association. The operating committee has recommended the establishment of ten technical committees embracing rates, insurance, power generation, transmission and distribution, electrical equipment, sales, accounting, statistics, codes and standards. Meetings of the old committees are planned on a recess basis pending complete organization.

When the board of trustees passes on the committee's recommendations the results will be communicated to the power industry. The plans outlined provide for admitting a number of individual members to the Institute, with dues probably corresponding to present annual dues of the national professional societies. The first convention of the Institute is scheduled for Chicago, June 5-8.

St. Lawrence Power Will Create Its Own Market

Early doubts about the economic feasibility of delivering St. Lawrence power about New York state and into New York city are waved aside by the Power Authority in its annual report just filed with the Legislature. An estimated reduction of 20 per cent in construction costs since the 1926 prices used in the original estimates plus the chance to go extensively to a promotional rate are the principal factors cited to justify the prediction that the river development will lead to a 3-cent domestic rate, which will quickly induce 1,200 kw.-hr. of average use, thus diluting distribution costs and further substantiating the feasibility of the project. Allocation to New York state of only $89,726,000 as its share of cost for power construction in the federal set-up has been another factor favoring the project, and on this point the board says:

"This accommodation, requiring a minimum of capital outlay on the part of the industry, will serve to bridge over the transition period which forward-looking utility executives see as the chief obstacle to sharp rate reductions necessary actually to bring about that extensive domestic utilization of electrical equipment on which the industry's future well-being seems to depend."

In fact, the Power Authority is confident that the result will be the "cheapest electricity available in large units anywhere in the United States." Generating costs, at 50 per cent load factor, are estimated to range between 2.6 and 3 mills per kilowatt-hour. This figure compares with average costs of generation, reported from the state's utilities, of 4.414 mills for water power at 51 per cent load factor and 10.654 mills for steam plants at 31 per cent load factor. With the lower St. Lawrence costs of generation it should be possible, the board says, to deliver power to New York city at 5 mills.

▼

New Approach Needed to Utilization Problems

"While electrical manufacturers are the logical means of perfecting and popularizing improved and new utilization devolpments, nevertheless the possibility of producing major advances is latent in the entire technical talent within the industry," declared A. H. Kehoe, vice-president New York Edison Company, to a group of engineers formerly affiliated with the New England division, N.E.L.A., who met recently at Boston. Good service at reasonable prices in the past has been due to engineering progress, asserted the speaker who maintained that the formula for the future likewise will be found to be that by setting up both improved and additional utilization means, combined with good electric service at fair costs, the business of the industry will be greatly expanded. The proper amount of engineering endeavor must be applied to this objective, however.

"Any one who has the ability to visualize the means of either performing some new useful service or improving present service should be encouraged by the industry, with the support of all engineers and constructive criticism looking toward further progress. From the standpoint of lowering system costs per unit of delivered energy, one cannot safely ignore the need of utilization equipment with the widest popular appeal, since there is a technical certainty that increased use on each existing service will lower the cost per kilowatt-hour delivered," said Mr. Kehoe. "Lower system costs and satisfactory service for the expanding use of customers are old and well-known problems, but they are by no means static. Many of the former constants used in solving the equations suitable for our earlier periods of expansion have now become the principal variables in the new solutions to be sought. Such matters as increased and diversified utilization, changing the standards for good service, or the present marginal or increment costs for additional load requirements, are of the type where previous evaluations are of little use in view of changed conditions."

Two specific topics were touched upon by the speaker in relation to changing aspects of distribution—the Diesel engine and isolating distribution costs for public purposes. Mr. Kehoe said that it is the industry's job to know its costs and performance and also if there are any means whereby its use would lower system costs.

Well, Where Do We Go From Here?

Humpty Dumpty, it has been said, achieved a tremendous climax of a singularly unsatisfactory sort. That was the end of Humpty Dumpty. If the collective agonies of the past few weeks do nothing more to the national state of mind than emphasize with burning clarity the fact that we cannot go back, but must go forward to whatever the future holds, the lesson that we have had will have been almost worthy compensation for the sorrow.

Idle indeed it is, at this late date, to wax lyrically regretful at the sidestepping evasions which postponed the day of reckoning. The R.F.C. venture, with its never-to-be-expiated sin of having not only deceived most of us but to have intensified the situation, made it a trebly poignant blow.

We are not going back to the glamorous days of 1926-1929 because we should never have been there. We are not going back because the day of living on future and problematical earnings and income has yielded to the fundamentally Puritantical concept that you can't get something for nothing. "We must pay earth's price for what earth gives us."

America is going to pull through. It is going to do so very nicely, too. It is going to be a reasonably prosperous place to live in, because the American people and American resourcefulness are going to make it so.

There are no business indicators that can be taken to have any meaning whatever at the moment. It is enough to recall that the suspension of the banking facilities of the nation came at a time when trade showed clear signs of responsiveness to an upward move.

U. G. I. Profits Discussed at Trade Hearing

Testimony that the return on common stock in the United Gas Improvement Company mounted rapidly after 1920 was laid before the Federal Trade Commission this week by Erwin T. Harris, a commission examiner.

Mr. Harris' report showed the return rose from 2 per cent in 1920 to 15 per cent in 1930. At the same time, he testified, the yearly percentage increase in surplus rose from 3 in 1920 to 15 in 1930.

Investigation of the accounts of the company, parent to a large group of public utility companies in eastern Pennsylvania and New England, began with testimony regarding the amount of gas and electricity the company sent in interstate commerce in 1929.

The commission also heard a detailed history of the company's formation from dozens of small utilities throughout the area.

Going further into the company's earnings, the examiner found the average annual rate of return on its investments, based on cost, included:

The Allentown & Bethlehem Gas Company, 21; Chester County Light & Power Company and Delaware Electric Power Company, 6; Chester & Media Electric Railway, 8; Erie County Electric Company, 11; Harrisburg Gas Company, 83; Lebanon Valley Gas Company, 3; Philadelphia Electric Company, 11; Consumers Gas Company of Reading, 19.

The Harrisburg return, the largest of the Pennsylvania group, was even larger between 1903 and 1924, the examiner said. During those years, he said, the average return amounted to 90 per cent on an average annual investment of $44,893.

Coming Meetings

National Sales Section, N.E.L.A.—Committee meetings, Chicago, March 21-23. A. J. Marshall, 420 Lexington Ave., New York.

National Engineering Section, N.E.L.A.—Committee meeting, Detroit, Mich., April 3-7. A. J. Marshall, 420 Lexington Ave., New York.

Maryland Utilities Association—Baltimore, Md., April 21. D. E. Kinnear, 803 Court Square Bldg., Baltimore, Md.

Missouri Association of Public Utilities—Excelsior Springs, Mo., April 27-29. N. R. Beagle, 101 West High Street, Jefferson City, Mo.

American Institute of Electrical Engineers—District meeting, Schenectady, N. Y., May 10-12. H. H. Henline, 33 West 39th St., New York.

Electrochemical Society — Montreal, Que., May 11-13. Colin G. Fink, Columbia University, New York.

National Fire Protection Association—Milwaukee, Wis., May 29-June 1. A. R. Small, 109 Leonard St., New York.

Edison Electric Institute—Chicago, Ill. June 5-8. A. J. Marshall, 420 Lexington Ave., New York.

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New Indiana Tax Law Hard Blow to Utilities

Every utility in Indiana, whether transportation, electric, telephone or gas, will be hard hit by the new "gross income tax" law, which passed the Legislature, has been signed by the Governor and goes into effect May 1. The law is a combination sales and income tax measure. It provides that all utilities in the state, of whatever nature, shall pay 1 per cent of their gross income a year to the state, exempting $1,000 and taxes paid through other channels. Not only that, but all officials and employees making more than $1,000 a year shall pay 1 per cent of all earned more than the first $1,000, no provision being made for any deductions for dependents. The taxes shall be paid quarterly if the total amount to be paid during the year will exceed $40, and if not, returns must be made annually.

An exemption is made on gross income that is derived from business conducted in commerce between Indiana and other states of the Union, or between Indiana and foreign countries, to the extent to which the state is prohibited from taxing under the Constitution of the United States. Pensions and life insurance incomes are exempted.

The new revenue measure was the target of intense opposition from business and manufacturing interests of the state, but was backed first by the new administration and then by organized farmers and real estate men and others, following a long campaign to broaden the tax base to relieve real estate from its present load.

Contracts in force at the time the bill goes into effect are to be exempt from its provisions. This means that unfilled orders contracted for prior to May 1 will not come within the purview of the tax collectors. While in most instances the tax will be passed on to the consumer, utility men say there already is much propaganda concerning utility costs and this will increase when the tax goes on. Bookkeeping also will be an added item.

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More Utility Bills Proposed to State Legislators

Presentation of additional utility measures for the consideration of the legislators of the various states continues. New bills, other than those already proposed (ELECTRICAL WORLD, February 11, page 180; February 18, page 212; February 25, page 244, and March 4, page 276), follow:

CALIFORNIA—Would prohibit public utility corporations from using funds for political campaigns and charging such expenses to advertising or miscellaneous. Would amend public utility act to prevent rates exceeding value of service rendered and would prohibit railroad commission from fixing a rate that gives a utility a greater return on its investment than the return on investments in other business undertakings. Would give commission jurisdiction over services rendered by publicly owned utilities outside its territorial boundaries. Would give publicly owned utility a lien on real property to secure payment for electric power supplied to owner. Would authorize meter deposits collected by public utilities that had been unclaimed for five years or more to revert to state.

MASSACHUSETTS—Would give the Department of Public Utilities supervision of associations which will sell electricity and gas to electric and gas companies under common ownership.

NEW JERSEY—Would authorize Board of Public Utility Commissioners to institute proceedings for a reduction of one-third of present rates of electric, gas, telephone and water service.

NEW YORK—Would amend the public service law to define public utility fees to be collected, amounts charged, methods of collection, etc. Would order electric and gas corporations to file reports with Public Service Commission of ten-year unclaimed consumer deposits and would order all deposits unclaimed for fifteen years to be paid, together with accumulated interest, within 30 days into the treasury of the state. Would declare the policy of the state of New York in respect to the use of St. Lawrence River for the improvement and furtherance of commerce and navigation and the protection and development of the water-power resources thereof and would provide for the creation of "the Power Authority of the State of New York" to effectuate the same. Would create a temporary state commission to make a survey of utility companies engaged in the manufacture, transmission and sale of electricity and gas in the state for the purpose of investigating rates, rate base, financing of such companies and their affiliation with subsidiary and holding companies.

OHIO—Would amend state sanitary district act to make it provide for establishment of central power district to furnish electricity for six counties.

OKLAHOMA—Would order that profits from municipally operated public utilities be distributed to general fund if there is no sinking fund levy. Would authorize municipal corporation to make contracts for installation of public utilities to be paid for from profits of corporations.

UTAH—Would authorize state to finance, build and operate steam-electric power plants, with low-pressure coal distillation as a side line.

TEXAS—Would prohibit reduction of public utility rates for purpose of eliminating competition. Would authorize appointment by Governor of three-member public utilities commission to be supported by a tax of one-fourth of 1 per cent on gross receipts of utilities.

WASHINGTON—Would permit irrigation districts to sell power to municipalities. Would amend power district initiative by providing that special elections may be called for creating public utility districts. Would authorize Department of Public Works to regulate rates, charges and practices of cities and towns selling electric power outside their corporate limits. Would authorize state to retain in perpetuity control of all water-power development and power sites and organize a state hydro-electric commission and develop power, separately or in conjunction with other states of the United States. Would create board of state officials, composed of the Governor, state Treasurer and Director of Conservation and Development, to survey a route for a super-power transmission system to start at the Grand Coulee and include Spokane, Walla Walla, Pasco, Yakima, Ellensburg and Wenatchee. Would authorize board to issue $10,000,000 in bonds for construction of the line.

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Baltimore Rate Cut Protested

Following recent announcement that beginning June 1 the Consolidated Gas, Electric Light & Power Company of Baltimore would decrease its rates for electricity by $550,000 (ELECTRICAL WORLD, February 25, page 248), a resolution has been introduced in the Baltimore City Council by Councilman Daniel Ellison asking Gov. Albert C. Ritchie to take action to bring about "a condition wherein the public would receive fair treatment at the hands of our utility corporation." The resolution has been referred to the committee on legislation and it is planned to hold public hearings.

Southern California Edison Earns $2.02 per Share

(Year ended Dec. 31, 1932)

Earnings	
Gross earnings	$37,158,391
	8.7% below 1931
Net earnings	$20,943,428
	5.0 below 1931
Operating ratio	44
	in 1931, 46
Depreciation allowance	$4,650,000
	12.5% of gross earnings
	1.3% of plant investment
Times prior charges earned	2.9
	in 1931, 3.2
Net balance per share of common	$2.02
	in 1931, $2.53
Dividends declared on common	$2.00
	in 1931, same
	Compared with 1931, per cent
Output	
Energy output, kw.-hr.	2,856,603,000 —6.7
Average use per customer, kw.-hr.	3,250
	in 1931, 3.510
Balance Sheet	Compared with 1931, per Cent
Total assets	$385,031,340 +0.3
Funded debt	$138,360,000 +1.6
Capitalization	$330,433,725 +0.3
Total surpluses plus reserves	$ 42,193,153 +9.1
Ratio current assets to current liabilities	1.7
	in 1931, —0.7

Price range of common, $33 to $16 in 1932. Current price of $21 is 10.3 times 1932 earnings.

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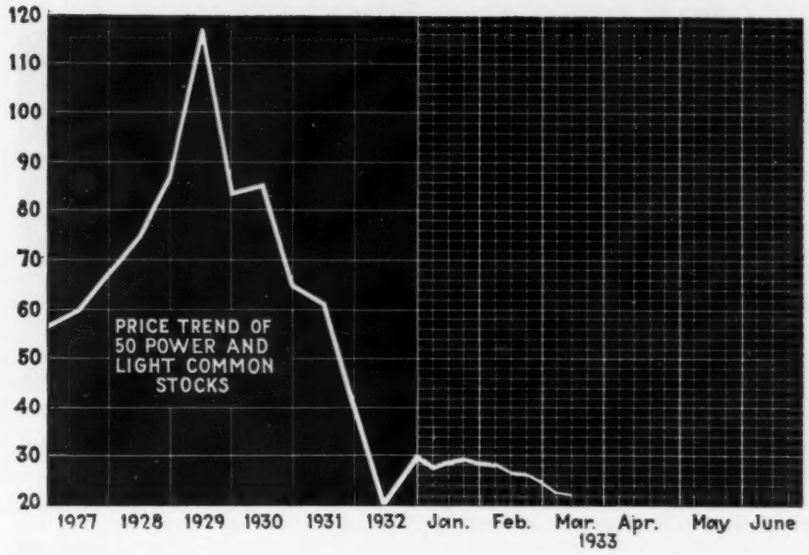
Stocks Hold Firm Before Holiday



Although no substantial gains were made by the utility stocks the day preceding the bank holiday, the list held firm. The "Electrical World" index reached the 22.6 mark, as compared with 22.9 as of Tuesday of that week.

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Public Service of N. J. Earned $3.35 in 1932

In the annual report covering 1932 operations the Public Service Corporation of New Jersey shows a consolidated net income of $28,289,378, equal after preferred dividends to $3.35 a share earned on 5,503,193 no-par common shares, against $30,540,752, or $3.85 a share, in 1931. Operating revenues amounted to $125,833,707, against $137,259,454 in 1931. Operating income after expenses, taxes and depreciation, was $42,965,169, against $45,397,682. Total income was $42,633,516, against $46,340,839. Surplus after dividends was $276,417, against $2,486,303. Dividends of $3.30 a share were paid on the common stock in 1932, against $3.40 in the three preceding years.

Current assets at the end of 1932 were $51,282,716, including $29,625,465 cash and $2,745,000 United States Government securities, while current liabilities amounted to $6,538,287 and accrued liabilities were $8,359,071. Reserves amounted to $85,957,719.

The report stated that the severe recession of industrial and commercial activity experienced by practically all business during the year resulted in decreased revenues from electric, gas and transportation operations. Revenue received from total electric sales decreased 3.89 per cent, while revenue derived from transportation was 21 per cent less than in 1931.

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R.F.C. Backs Virginia Plant

Agreement to purchase $129,000 general obligation bonds of the city of Radford, Va., bearing 5 per cent interest, to be purchased at a price to yield better than 5½ per cent, has been announced by the Reconstruction Finance Corporation. Radford will construct a dam on the Little River to operate a 1,000-hp. hydro plant to replace its present oil engine power plant.

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Current Earnings Reports of Electric Light and Power Companies

Operating Companies

	1932	1931	Per Cent Increase	Operating Ratio 1932	1931
Brooklyn Edison (Year ended December 31)					
Gross earnings	$47,562,379	$48,041,050	— 0.9	66	66
Net earnings	16,243,129	16,976,615	— 4.3	..	..
Net balance	13,326,214	14,400,782	— 7.5	..	..
Detroit Edison (Year ended Jan. 31, '33)					
Gross earnings	43,567,765	48,766,104	—10.6	71	65
Net earnings	12,546,360	17,226,921	—27.2	..	..
Net balance	6,344,653	11,277,278	—44.0	..	..
Kansas City Power & Light (Year ended December 31)					
Gross earnings	14,767,388	14,759,480	— 0.0	61	59
Net earnings	5,736,179	6,046,574	— 5.1	..	..
Net balance*	3,952,869	4,516,973	—12.5	..	..
Puget Sound Power & Light (Year ended December 31)					
Gross earnings	13,549,978	15,765,898	—14.1	61	62
Net earnings	5,319,210	5,982,722	—11.1	..	..
Net balance	391,203	899,579	—56.5	..	..
Virginia Electric & Power (Year ended December 31)					
Gross earnings	15,428,448	16,957,180	— 9.0	64	66
Net earnings	5,570,017	5,679,655	— 1.9	..	..
Net balance	2,498,518	2,714,802	— 8.0	..	..
United Electric Light & Power (N.Y.) (Year ended December 31)					
Gross earnings	28,086,582	27,142,185	3.5	63	63
Net earnings	10,480,577	10,073,228	4.1	..	..
Net balance	6,983,414	6,574,015	6.2	..	..

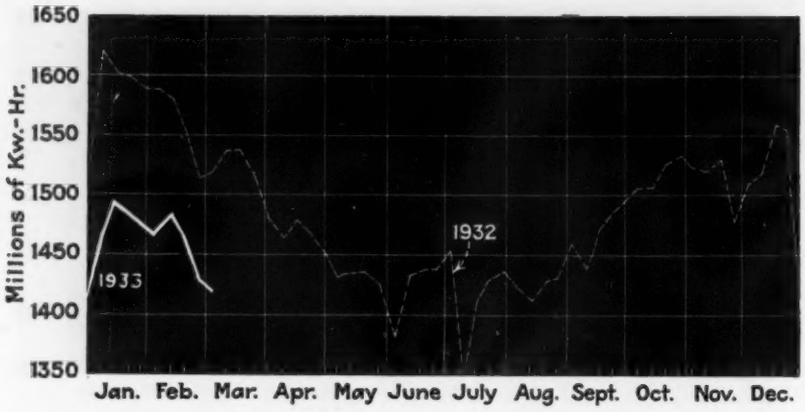
Holding Companies

	1932	1931	Per Cent Increase	Operating Ratio 1932	1931
American Water Works & Electric and Subsidiaries (Year ended December 31)					
Gross earnings	$43,671,609	$49,931,729	—12.5	..	..
Net balance	2,491,621	5,199,166	—52.1	..	..
Columbia Gas & Electric and subsidiaries (Year ended December 31)					
Gross earnings	79,155,168	89,404,032	—11.4	66	66
Net balance	11,120,027	16,451,514	—32.4	..	..
Commonwealth & Southern and subsidiaries (Year ended Jan. 31, '33)					
Gross earnings	113,202,670	129,172,883	—12.3	54	53
Net balance	3,390,437	12,972,513	—73.6	..	..
Public Service Corporation of N.J. and subsidiaries (Year ended Jan. 31, '33)					
Gross earnings	124,292,510	136,557,310	— 9.0	66	67
Net balance*	27,478,464	30,731,077	—10.6	..	..

* Available for all dividends.

Gross earnings — (Operating Companies) Gross operating revenue. (Holding Companies) Gross operating revenue plus other income. Net earnings — Earnings after deduction from gross earnings of operating expenses taken to include taxes, depreciation, maintenance, operating, etc. Net balance — Balance available from income for common stock dividends.

Small Drop in Week's Output



Central electric light and power plants had an output during the week ended March 4 that was down a small fraction of 1 per cent from the preceding week, production being 1,422,875,000 kw.-hr., according to the Edison Electric Institute. The general trend at this season is downward, although corresponding figures for these particular two weeks in recent years show a small rise. Compared with 1932 the output is down 6.4 per cent, the disparity having increased somewhat in the past few weeks after its earlier shrinkage.

In the Central industrial area and on the Pacific Coast the comparison with 1932 shows little change from the week of February 25. On the Atlantic Seaboard there has apparently been a moderate decrease in activity, more pronounced in New England than elsewhere.

Weekly Output, Millions of Kw.-Hr.

Week Ended	1933	1932	1931	1930
March 4	1,423	1,520	1,664	1,750
February 25	1,426	1,512	1,633	1,744
February 18	1,470	1,545	1,680	1,746
February 11	1,483	1,579	1,684	1,770
February 4	1,455	1,589	1,679	1,782

Per Cent Change from Previous Year

Region	Week Ended Mar. 4	Feb. 25	Feb. 18
Atlantic Seaboard	— 5.2	— 4.1	— 4.6
New England alone	— 7.1	— 5.5	— 5.1
Central industrial	— 9.6	— 9.4	— 6.9
Pacific Coast	— 5.3	— 5.4	— 7.0
United States	— 6.4	— 5.7	— 4.9

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Utilities Have Two-Month Fuel Supply in Storage

Public utility electric power plants had an output in January of 6,909,000,000 kw.-hr., or 8 per cent less than a year ago, it is reported by the U. S. Geological Survey. The rate of decrease was the same as in December. The decrease from January, 1931, was 13 per cent, which is a rather better showing for the two-year interval than that of last spring and summer. Average daily production fell off 3 per cent from December. Of the January output 41 per cent came from water power.

The per cent decrease in January, compared with a year ago, in each of the several geographical regions was as follows (corresponding change for December in parentheses): New England 9 (9); Middle Atlantic 6 (6); East North Central 13 (9); West North Central 4 (14); South Atlantic 4 (3); East South Central 16 (11); West South Central 15 (9); Mountain 16 (20); Pacific 5 (9).

A new item in these reports, the Survey announces that on January 31 the coal-burning plants had on hand a stock of 5,658,000 tons of coal, of which 4,497,000 tons was bituminous coal (including lignite) and 1,161,000 tons was anthracite. The January consumption of bituminous was 2,388,603 and of anthracite 115,758 tons. At this rate the bituminous stocks were sufficient to last 58 days and the anthracite 311 days.

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Quebec Increase Helps Canadian Production

Output of Canadian central stations is running close to the figures recorded a year ago. In January they generated 1,396,658,000 kw.-hr., compared with 1,413,918,000 kw.-hr. a year ago. This is a decrease of 1.3 per cent. December production, 1,433,191,000 kw.-hr., had shown a small increase.

All but 2.2 per cent of the January output was hydro-electric. Production from water power in Quebec, 785,142,000 kw.-hr., constituted more than half the Dominion's total, and exceeded last year's January by 9 per cent. In Ontario, with 318,039,000 kw.-hr., there was a decrease of 15 per cent. Water power production, in kilowatt-hours, in other provinces and the per cent changes for the interval of a year were as follows: Maritime Provinces 44,535,000, —8.3; Prairie Provinces 116,099,000, — 10.7; British Columbia 102,521,000, —5.0. Corresponding figures for fuel power were: Prairie Provinces 18,249,000, —10.5; other provinces 12,073,000, +12.1.

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15,817,941 Hp. in Water Power

Water-power installations in plants of 100 hp. or larger at the beginning of 1933 had an aggregate capacity of 15,817,941 hp., the Geological Survey announces. The increase during 1932 was 1.6 per cent. Of the total, 14,023,695 hp. was in public utility and municipal plants and 1,794,246 hp. was in manufacturing and miscellaneous plants. The survey report also gives the corresponding data by states.

The ten leading states and the respective percentages of the total installed water power in the United States were: (1) California, 15.5; (2) New York, 12.0; (3) Washington, 6.6; (4) North Carolina, 6.1; (5) Alabama, 5.9; (6) South Carolina, 5.1; (7) Maine, 3.9; (8) New Hampshire, 3.5; (9) Wisconsin, 3.3; (10) Georgia, 3.2. These ten states contain 65.1 per cent of the country's developed water power.

The United States leads the world in capacity of installed waterwheels. Canada, with 7,045,000 hp. ranks second.

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Seattle Construction Plan Opened to Bidders

Although the city of Seattle and the Reconstruction Finance Corporation have not come to a final agreement on the obtaining of a loan to finance a construction program, the City Council utilities committee has approved plans for competitive bidding among contractors on the program involving a total of $3,500,000.

The R.F.C. offered to advance $1,625,000 at 6 per cent interest to complete the new construction, and New York bankers offered money at similar rates on bonds to retire the warrants, provided an audit of the lighting department's accounts and records for the last three years and nine months showed a satisfactory condition. J. D. Ross, superintendent of lighting, believes better terms can be obtained from the R.F.C. and perhaps the bankers after the new adminstration becomes effective. V. C. Webster, chairman of the committee, states that by calling for bids at this time it can be ascertained definitely what the work will cost. Bidders under the utilities committee plan will be required to take city light bonds at par for the new work and to furnish enough cash on additional bonds to retire the warrant debt.

Cleveland Rates Reduced Under New Contract

Volunteering to reduce its rates for domestic service a year and a half prior to the expiration of its existing contract with the city, but declining to yield access of its records to City Council, the Cleveland Electric Illuminating Company has offered a new rate structure in which there is a 4-cent maximum against the previous 5-cent one with a reduced minimum charge. The new contract is to run for five years from the end of the existing franchise.

Commercial rates in Cleveland have also been reduced. The Ohio Public Utilities Commission has approved new rates for large commercial and industrial customers that will affect 1,500 and bring an estimated annual saving of $700,000.

Cleveland's municipal plant is the subject of controversy in the City Council, where it is proposed that further expansions in service be made. While the plant is alleged to have made a profit of $688,542 in 1932, there is an unpaid item of $925,000 for city street lighting.

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Municipal Plant Ban Lifted by Texas Court

Construction of municipal electric light and power plants in cities and towns of Texas which already are being served by private companies operating under franchises may now take place without legal hindrance, according to a decision of the United States Circuit Court of Appeals at New Orleans.

The case in question was that of the Texas Electric Company against Fairbanks, Morse & Company, in which the former had been granted an omnibus injunction, restraining the latter from entering into contracts with 65 communities in Texas for the construction of electric light and power plants.

The court at New Orleans reversed and remanded the decision of the lower court which had issued the injunction on the grounds that the legal rights of the Texas Electric Company were being infringed upon by Fairbanks, Morse & Company.

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Power Area Backed at Akron Parley

Advocating the establishment of a central power plant to furnish electricity for six counties, a motion seeking amendment of the state sanitary district act to make it provide for a power district has been adopted by representatives of seventeen northeastern Ohio cities, meeting in the City Council chamber at Akron. Leslie S. Miller, chairman of Akron Council's public utilities committee, proposed that a united effort be made to obtain a reappraisal of the properties of the Ohio Edison Company and the Ohio Public Service Corporation in order to obtain a working base in fixing rates.

Committees of representatives from cities served by each company were appointed to contact officials of other cities supplied by the utilities to sound out their reactions to the proposal. Municipal ownership of distribution plants, whereby power companies would bid for the right to furnish energy, was also discussed. The City Council voted to bury in committee an ordinance that would slash electric rates a third.

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Consolidated of Baltimore Earned $4.29 a Share

(Year ended Dec. 31, 1932)

Earnings		
Gross earnings	$27,506,331	3.5% below 1931
Net earnings	$8,791,323	8.9% below 1931
Operating ratio	68, against 66 in 1931	
Depreciation allowance	$2,270,418	8.2% of gross earnings 1.8% of plant investment
Times prior charges earned	3.1	in 1931, 3.4
Net balance per share of common	$4.29	in 1931, $5.21
Dividends declared on common	$3.60	in 1931, Same
Output		Compared with 1931 per Cent
Energy sales, kw.-hr.	758,654,047	— 3.2
Average use per customer:	3,414 kw.-hr. as compared with 3,510 in 1931.	
Balance Sheet		
Total assets	$152,305,365	— 2.6
Funded debt	$63,198,000	— 0.6
Capitalization	$125,125,810	— 0.3
Total surpluses plus reserves	$22,410,622	—13.2
Ratio current assets to current liabilities		5.2 in 1931 5.8

Price range of common, $70 to $39 in 1932. Current price of 53 is 12.3 times 1932 earnings.

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British Company Concludes Hungarian Contract

Arrangements have just been concluded by the Metropolitan-Vickers Electric Company, Manchester, for the carrying out of a $1,250,000 contract for the Hungarian State Railways. This work will be done at the company's works at Trafford Park, Manchester, and at its subsidiary works in Sheffield.

The contract includes 26 motors, each of 2,500 hp. capacity, and the greater part of the control equipment for 26 electric locomotives, the total weight of the work being 900 tons. The company has previously equipped four substations of the Hungarian State Railways, and the tests of passenger and freight locomotives already delivered to that railroad proved so satisfactory that authority has been given to proceed with the further work that is now to be undertaken.

Major New Construction This Week

Machine drives, motors and controls, transformer equipment, refrigerating machinery, conveyors, electric hoists, etc., will be purchased for new brewing plant of Miami Brewing & Storage Company, Miami, Fla. Estimated cost $200,000.

Radford, Va., has authorized plans and will soon take bids for equipment for city-owned hydro-electric power plant on Little River, including transmission line. Fund of $129,000 available.

Until March 29, Public Works Officer, Navy Department, New York, N. Y., asks bids for switching equipment for central power plant, Building No. 40, local navy yard (Specification 7240).

Motors and controls, panelboards, conveyors, etc., will be installed by Pharma Chemical Company, Bayonne, N. J., in connection with rebuilding of portion of plant destroyed by fire. Cost over $100,000.

Geneseo, Ill., authorized fund of $150,000 for city-owned electric light and power plant and soon takes bids for equipment.

Seattle, Wash., soon calls for bids, closing about April 15, for completion of Diablo power plant of Skagit River power development, including equipment and installation, and construction of transmission line. Fund of $1,620,000 available.

Until April 18, Construction Service, Veterans' Administration, Washington, D. C., asks bids for electric utilities for new $1,000,000 general hospital at Roanoke, Va., including conduit wiring, outdoor distributing system, electric refrigerating and ice-making plant, electric elevators, electric ventilating equipment, etc.

Machine drives, motors and controls, electric refrigerating machinery, conveyors, electric hoists, etc., will be purchased for plant of Harvard Brewing Company, Lowell, Mass. Cost about $500,000.

New Rectifier for Belgian Railways

A portable mercury-arc rectifier station has recently been supplied to the Belgian National Railways by the Siemens-Schuckert Company of Berlin, for use on sections of track where extra electric power is required to meet increased traffic demands. The equipment is mounted on a rubber-tired trailer, enabling it to be hauled by a tractor to any point on the railroad.

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New York Metal Prices

	Feb. 28, 1933 Cents per Pound	March 7, 1933 Cents per Pound
Copper, electrolytic	5.00	5.00
Lead, Am. S. & R. price	3.00	3.00
Antimony	5.70	5.70*
Nickel ingot	35.00	35.00
Zinc, spot	3.00	2.70*
Tin, Straits	23.20	.....
Aluminum, 99 per cent.	23.30	23.30

* Nominal.

Potomac Valuation Stands

Final order upholding its original valuation of the properties of the Potomac Edison Company has been handed down by the Maryland Public Service Commission. Following hearings held recently the commission fixed $15,682,043 as the fair valuation of the properties. Of this amount the commission placed $11,616,072 as the valuation of the electric properties. The company protested the valuation and was given a hearing on the protest. In the meantime the case has been appealed to the Circuit Court in Baltimore.

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Philadelphia Rate Cut

Taking exception to the Philadelphia Electric Company's new rate schedules (ELECTRICAL WORLD, February 4, page 146) on the grounds that they involve substantial increases instead of reductions a group of consumers has petitioned the Pennsylvania Public Service Commission to enjoin the company from putting the new rates into effect. Elimination of the lamp replacement clauses of the previous rates was the main point of contention.

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Fitchburg Had Best Display

Fitchburg (Mass.) Gas & Electric Light Company has been awarded first prize in the nation-wide contest on the best Christmas display of electric refrigerators. The contest was conducted by the Electric Refrigeration Bureau. Accompanying the honor of the award is $100 in cash.

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New Indiana Commission

Governor McNutt of Indiana has signed the administration public service commission ripper bill and named the three members of his new commission and the public counselor provided by the new law. New commissioners are: Perry McCart, attorney; Mole Cook, manufacturer, and Samuel Trabue, Mayor of Rushville. The public counselor will be Sherman Minton. The bill carried an emergency clause and was effective immediately upon signature.

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Virginia Rate Case Financing

State and not power company funds will finance the investigation of the rates of Virginia public service companies now under way (ELECTRICAL WORLD, February 4, page 148). Governor Pollard's decision will probably mean a deficit of $35,000 in the Virginia Corporation Commission's budget allowance unless, as hoped by the Governor, some way can be found to secure assistance from cities of the state. The Governor has mentioned the possibility of saving as much as $2,000,000 a year in energy charges if no more than a 10 per cent reduction eventuates.

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Washington Gets Safe Harbor Power

Last week the new 230-kv. transmission line of the Pennsylvania Water & Power Company linking substations near Baltimore and Washington went into service, bringing Safe Harbor hydro plant energy to the nation's capital. The transmission project involved an expenditure of $1,750,000 along a 250-ft. right-of-way. It is 22 miles long. Connection is made with the Potomac Electric Power Company.

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Tennessee Plan Indorsed

Following a three-day conference of its committee of 500 the Southeastern Council has unanimously approved the ambitious scheme of President Roosevelt (ELECTRICAL WORLD, February 11, page 183) for the development of the Tennessee Valley "as a national demonstration of social and economic planning and of emergency relief." The council, "an organization for the logical development of the mutual interests" of Southern states "and composed of selected leaders from these states," claims to have investigated the scheme thoroughly.

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Colorado Rules on Utility Status

That a company which provides electrical energy to a municipality or company for retail distribution is not a public utility and therefore is not required to obtain a certificate of public convenience and necessity is the decision of the Colorado Public Utilities Commission. The case was that of the Colorado Utilities Company vs. the Moffat Coal Company and covered service to the town of Oak Creek.

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American River Project

Permission to abandon part of its hydro development work on the American River in California has been sought of the Federal Power Commission by the Pacific Gas & Electric Company. The company would avoid the enlarging of several reservoirs, would change the borders of others and eliminate those of another group.

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$196,190,000 for Radio

Last year America spent $196,190,000 for home radio equipment, according to *Radio Retailing*. Of this $124,860,000 was spent in purchasing 2,620,000 radio sets of all types and 143,000 automobile sets. Radio tubes accounted for $48,730,000 and 44,300,000 units.

Would Speed Illinois Rate Case

New petitions demanding an immediate reduction of 20 per cent in the electric rates of the Public Service Company of Northern Illinois have been filed with the Illinois Commerce Commission though the commission is still conducting hearings in a tax rate case which has been proceeding for more than a year. Petitioners ask that the rates be reduced immediately and that inquiry be conducted later to determine further cuts. New commodity and material price levels are offered as justification for change.

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Kitchen Appliances Featured

Continuing its plan (ELECTRICAL WORLD, February 18, page 216) of each month featuring a group of appliances for intensive sales efforts the Electrical Association of New York has selected kitchen mixers and electrical cooking devices for its March push. About 350 manufacturers, distributors and dealers are involved.

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Lexington Bonds Deposited

According to the Associated Gas & Electric Company approximately 95 per cent of the outstanding $5,000,000 5½ per cent convertible gold debentures of the Lexington Water Power Company were turned in for exchange on a par basis for Associated Electric Company 4½ per cent gold bonds. It is also announced that a substantial amount of Lexington first mortgage 5 per cent gold bonds had been deposited for Associated Electric 5 per cent gold bonds (ELECTRICAL WORLD, February 11, page 177).

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Abandons Ornamental Lighting

Bellingham, Wash., whose ornamental downtown lighting system was inaugurated five years ago, when Thomas A. Edison pressed a key in his Florida home, will be replaced with a mixed system of intersection lighting at greatly reduced expense, for the next ten months. City Council came to this decision after business men and property owners had refused further to bear the main burden of the elaborate system.

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Sun-Glo Sues General Electric

Alleging distribution by the defendant of a circular criticising the electric lamp bulbs manufactured by the plaintiff, the Sun-Glo Lamp Works, Inc., of Brooklyn, N. Y., has entered suit against the General Electric Company for $505,000 damages. The complaint asserts that the circular was sent to dealers in bulbs and that it contained "false and malicious statements" which damaged the business of the plaintiff.

Bare-Neutral Report Up for Consideration

Three conclusions on the use of bare neutrals for interior wiring systems were being circulated this week among organizations represented in the electrical committee of the National Fire Protection Association for consideration at the annual meeting of the committee on March 14. These conclusions, which were embodied in the progress report of a special N.F.P.A. committee on the subject (F. V. Magalhaes, chairman), are:

1. Possible economies and advantages may accrue from the use of bare neutral interior wiring.

2. Any hazards involved in the use of a bare neutral conductor up to outlet points, under the conditions specified in this report, do not appear greater than those existing with types of wiring now recognized in the National Electrical Code under conditions found in actual installations.

3. Neither the available facts nor the urgency of the matter seem to justify the time and expense which would be entailed in an industry conference on the subject, at this time.

No attempt has been made by the committee to consider the detail construction of concentric wiring material or the use of rigid conduit as a neutral conductor, as these are considered special applications of the general principle of "bare neutral."

Such expected advantages as lower wiring cost, greater assurance against reversed polarity and better clearance of faults by fuses cannot be appraised with accuracy until the system has been more thoroughly tried, it is reported.

Five conditions which had been presented to the committee as possible hazards are discussed in the progress report. The committee considers that the provision for not less than two parallel paths in the neutral conductor or to ground from each outlet, whereby each of these paths must be open to make the exposed metal parts alive, provides adequate safeguard against such occurrence. The use of bare neutral wiring throughout buildings should be limited to locations having water pipe grounds pending more experience data. Bonding together all metallic systems in the building at two or more points forms a network having such low resistance that an arc will not occur when a section of one of these paths is opened. Regarding electrolysis, the committee reports no positive evidence of electrolysis with alternating current at commercial frequencies.

Bare neutral wiring appears to be of a character which may be readily supervised, reports the committee. With this system some think insulation tests will be unnecessary, as bad spots will very likely cause a short and blow a fuse. The effect of such wiring on design of wiring devices is regarded as outside the scope of this particular committee.

Brief reports of experience with bare neutral at the University of Wisconsin, Evansville, Ind., on the American Gas & Electric System, at Cleveland, Ohio, Detroit, Mich., and Rochester, New York, are included. Also embodied in the report are results of tests to determine the extent to which the neutral conductor of 3,963 interior wiring installations is unintentionally grounded. These data were considered in reaching the general conclusions mentioned.

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Reclamation Project Plants Net $400,166 Last Year

That the Muscle Shoals project may be operated by the United States Bureau of Reclamation, in the event that the Norris bill is approved, seems probable. This agency has been constructing and operating hydro-electric plants for years, nine of which had a gross revenue in 1931-1932 of $2,795,000 involving sales of power to municipalities, irrigation districts, corporations and individual farmers. The annual net revenue from reclamation power plants now amounts to several hundred thousand dollars, it is reported.

Twenty hydro-electric power plants on eleven of the 29 federal reclamation projects were in operation during the fiscal year 1931-32. These plants have a total installed generator capacity of 102,550 kw., and they generated 331,793,500 kw.-hr. of energy, of which 21 per cent was utilized for irrigation and drainage pumping, 65.4 per cent was sold for commercial and industrial uses, and the remainder, or 13.6 per cent, was used for miscellaneous purposes and consumed by losses. Eleven of these plants were operated directly by the water users, and nine, having a total installed generating capacity of 31,500 kw., were operated by the government.

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Cosmic Ray Concentrator

Just how much or how little cosmic rays may eventually mean to mankind is problematical, but efforts to popularize them with publicity are sustained. At the meeting of the American Physical Society in New York recently Dr. W. F. G. Swann, director of the Bartol Foundation, described a concentrator which it was said would through the use of 100,000 volts concentrate cosmic rays of 100,000,000 volts to "provide a source of radiation of convenient strength for use in experiments." The device, while planned, has not as yet been completed.

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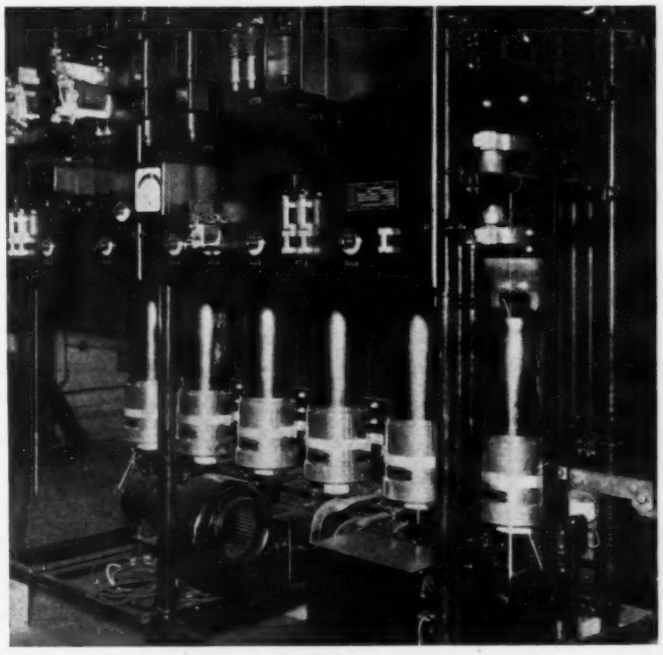
150-Kw. Phanotron Installation Completes Six Months' Service



At the Salem Street substation of the Edison Electric Illuminating Company of Boston an experimental phanotron tube installation of the General Electric Company converts alternating current into direct-current, 115-230-volt service for local distribution. The outfit consists of six tubes with a combined rating of 150 kw. The tubes are built with heated cathodes instead of using unheated cathodes as in the ordinary mercury-arc rectifier. Six months' commercial service has now been given by this experimental installation (ELECTRICAL WORLD, December 31, 1932, page 872).

EDITORIALS

L. W. W. MORROW
Editor

We shall have action

PUBLIC fear exerted upon bank deposits has forced a crisis in national affairs. We should be thankful that the crisis has been reached, because at last we shall have a thorough diagnosis of our disease and then apply drastic but curative remedies. We trust the government, we trust the banks and we trust our underlying physical and human assets, but we have been impatient with the past postponements and palliatives and welcome a crisis that calls for direct and effective action that will be constructive and not defensive.

We do not expect the impossible. We expect only competent leadership that will bring these curatives to bear: Our natural resources, our energy, our inventiveness, our optimism and our ability to adjust ourselves to changed conditions without hysteria. We expect a unified and sound banking system to emerge, we will get economy in government, we know business must rebuild itself and we anticipate a major operation that will write off paper assets and debts. We shall not be stampeded or lose our nerves, but we do demand results. We have every confidence that immediate action will be taken by our leaders and look forward, at last, to an upward turn in business as a result of this necessary and long-awaited emergency that forces our leaders to face facts and act courageously.

Is d.c. transmission nearer?

REFERENCES in recent technical literature to the possibilities of continuous voltage for long-distance transmission show that this interesting question is being more than kept alive in these troublous times of restricted experimental development. Thus in a recent issue of *Elektrotechnik und Maschinenbau* the conclusion is reached that the superior properties of the oil-filled underground cable as compared with the older solid type are still further enhanced if the cable is operated under continuous voltage, and that thereby it would be possible to consider underground transmission for the highest voltages and the longest distances.

More important than this, however, is a group of recent papers on the inverter by C. H. Willis, working in the laboratories of the General Electric Company, which describe a long step which has been taken toward the overcoming of one of the most serious obstacles to d.c. transmission, namely, the satisfactory conversion of continuous into polyphase alternating current. The conversion of a.c. power into uniform continuous current has been a simple matter with the mercury-arc rectifier owing to its unidirectional conductivity. The reverse of this process, however, is by no means as simple, as the d.c. must be shifted from tube to tube in uniform sequence, corresponding to the successive phases of the a.c. output, and this must be accomplished in such a manner as to give a fairly acceptable wave form. This has constituted a major type of problem for research development and the solution now offered is of outstanding interest and importance. By the use of the thyratron tube and an auxiliary source giving a harmonic of the fundamental a.c. frequency, it has been found that commutation from one tube to another may be satisfactorily accomplished, inverters operated to supply lagging loads, and a type of circuit is described which enables a polyphase inverter to produce a sinusoidal voltage and current. Equally interesting improvements by the use of the principle of harmonic commutation are also described for the rectifier using thyratron tubes.

The attractiveness of d.c. transmission is

measurably enhanced by contributions of this character. Obviously the inverter is the most important element as bearing directly on the question of satisfactory operation. As a consequence, further results with large-scale equipment, as promised in the papers referred to, will be awaited with the greatest interest.

Railroads at the wall

OUT of the National Transportation Committee's report protrude several items of interest to the electrical arena: "I am opposed at this time to the construction of the St. Lawrence waterway, because it would be a waste of public funds," says Alfred E. Smith in his supplementary remarks. The committee report on this point had the following: ". . . before ratification of the pending seaway treaty with Canada bargaining away valuable American rights, this project should be fairly tested on the rule of self-support and, if it fails, the treaty should not be ratified." Thus do one former Governor of New York and one President of the United States differ diametrically from an advocate of the canal who held one of these offices and is entering the other.

Regulation, valuation and rate making as administered upon the railroads came in for some epigrams and some epithets. A few of these phrases may be plucked from the two reports to tell their own message: "Regulation should not attempt to 'run the business' of transportation." "The complete breakdown of the present valuation formula has left the commission in a condition which would be laughable if it were not so serious." "Those who have given the subject of rate making the closest attention have abandoned the theory of making rates on some basis of valuation." "We see no reason why the rate-making rule should not say in plain English that railroads are entitled to make a reasonable profit based upon the costs of efficient operation." "I am not entirely satisfied that the prudent investment theory is unworkable. The reproduction cost theory is obviously obsolete and must be discarded." "Suppose that just a little common sense had been substituted for all this hash, this maze of regulation and red tape." ". . . to improve earning statements—not by increased traffic or government intervention—but by economies and improvements in operation, and perhaps by a reduction in rates to attract more business." "We believe that if the railroads had regarded themselves more accurately as purveyors of transportation rather than as guardians of a monopoly, they would have been more alert to take advantage. . . ."

Thus have the five men, in a report largely completed before the death of Calvin Coolidge, who headed the group, condemned La Follettism and its overgrown progeny, the Interstate Commerce Commission. Their pronouncements serve as a portent of what may be in store for utilities from over-regulation if the public forces them to go the way of the railroads.

Small heating devices sell

IN THE past five years more than 1,000,000 kw. in small electric heating units have been sold and it is estimated there is a potential load of 10,000,000 kw. in these units. Yet only about 100 utilities pushed the sales of these devices in 1932 despite definite sales plans produced by several manufacturers.

Actual records are now available on these sales programs and the results indicate that more utilities and other sales outlets should adopt a sales plan. These devices provide a spot of electric heat where it is needed and useful and the several forms of the devices enable them to be used for a wide variety of applications. Electric heat is non-competitive for most of the market and the small cost of the devices as compared to their utility and revenue-producing ability should bring about a cordial acceptance of sales programs.

These devices are sold by using sample kits, direct mail pieces and personal calls and several complete sales plans are available from manufacturers. Any of these may be used, or an individual plan may be devised very readily based upon past experiences. The possibilities for using electric heat are enormous and it can be sold in this market, for it does a good job and saves money. More vigorous and more universal efforts should be made to sell it.

Profits on Current Business

Both sales and manufacturing costs prevent profits.
Improved methods and organizations the solution.
Drastic changes necessary, but profits may be made.
Individual efforts aided by trade associations.

By L. W. W. MORROW
Editor ELECTRICAL WORLD

HOW can we make profits? This is the prevailing question of electrical manufacturers. They are in business to make money and they know that no business can survive without profits. They are not making profits now and most of them have made no profits for two years, so that the question reflects a serious condition for many companies. Evidence is ample that no large reserves, no efficient factory, no trained personnel and no strategic position in the markets can eliminate the necessity for profits.

Yet electrical manufacturers had a total production in 1932 aggregating $800,000,000, sold at a loss, contrasted with $350,000,000 in 1914 sold at a profit. Therefore, there must be some correlation between profits and the volume of business, the costs of business, the size of an enterprise, the organization for production and sales and the methods of doing business that both explains the no-profit status of manufacturing and indicates how losses can be turned into profits. It is difficult to define their correlation, but certain facts should be stated and certain principles applied that will turn business toward a profit-making level.

At present electrical manufacturing is organized as to structure and methods for the $2,500,000,000 business volume of 1929. Managements have skeletonized organizations, made many detail economies and used every effort to defend their organizations and policies on the premise that past business conditions and the past business volume will return. They have not applied the principle that no aspect of any business can remain fixed if profits are to be made and have neglected to make their functional activities flexible and variable to conform to market changes. The foundations for profits lie in the changing economic, sociological and psychological conditions that prevail in the markets and money is made only when these market conditions are exploited continuously in terms of economical production and profitable sales. Good business managers should always find out the buyer's judgment of values as a first requisite and then supply these values at a profit by good business methods. The mutual and ever-changing interest of producers and consumers is the gage of merit for determining the methods of business, and it is apparent that bad business conditions continue because manufacturers fail to be in accord with market conditions and prevailing economic forces. They wager their future on a return of conditions identical with that of a former period before they become bankrupt. This defensive attitude and this unwarranted optimism lead to disaster and are not complimentary to business managers, even though they are a normal human reaction to change.

Thus past history repeats itself in that business enterprises rise and fall at variable intervals and a breakdown is now occurring upon a large scale because of the application of economic penalties to past and present mistakes of business leaders. It is doubtful if any one could have built better or could have anticipated present business levels, but managements should not be forgiven for their failure to recognize present facts and act in accord with the forces that are rectifying maladjustments. It is best to act with them, for readjustments are inevitable and will not succumb to defensive measures such as political palliatives or artificial restoratives. The alarm bells are ringing to tell business to tear down and rebuild a better and sounder structure whose foundations will be profits instead of losses. Business must capitalize its present markets and the present conditions and cease waiting for time as the only agency to change losses to profits.

Growth under competition

Some perspective on the past growth of business is needed to show the reasons for present conditions and the forces that have come into action. Industry is made of individual enterprises, each of which attempted to succeed by gaining all possible advantages over competitors. An inevitable increase in size occurred as a defensive as well as an offensive weapon. The use of the corporate form of organization was premised upon a greater opportunity for each enterprise to take to itself all possible legal and economic advantages. Each corporation established its own organization and determined its own business policies. Each felt free to extend its activities into broader channels without consideration of other enterprises or of any social or economic effects. Might made right in an endeavor to get advantages over competitors and make greater profits.

In the past decade a manufacturing corporation, for example, sought to centralize its ownership and increase the scope of its activities by the use of specialized mass production factories for each product. It moved in one direction to buy or control all the raw materials it needed and in another direction to own or control all the trade agencies needed to reach the ultimate buyer with its products. In addition, it used surplus funds for stock market operations or for carrying credit for agencies necessary for production or sales, and thus introduced banking as one aspect of its business. It often bought interests in other enterprises either to gain sales or production advantages or to introduce the idea of reciprocity

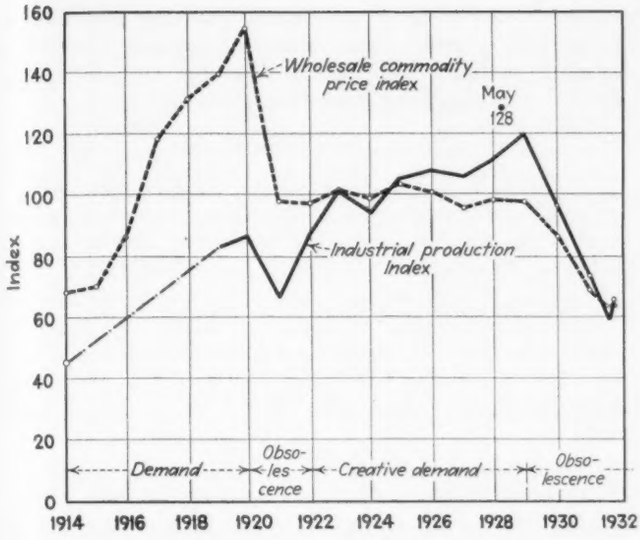


Fig. 1—Business guides point to the answer to profits

This graph of industrial production and wholesale commodity price indexes is significant to manufacturers. In the period from 1914 to 1920 rising prices and a big demand led to profits and organization expansion. From 1920 to 1922 a sharp drop in prices and in production found organizations too large and production too great; there were no profits to be made without meeting market conditions. From 1922 to 1929 there was a level of prices and a demand creation by sales efforts to secure volume. Some companies which had reorganized after 1921 made money, others were busy but made no money. From 1929 to 1932 there was a radical drop in production and price, with a present stabilization as indicated. Good business management will readjust organization and production to these levels and make profits.

in buying and selling. There were few limitations to the extension of the activities of a corporation acting under the spur of profit making in a highly competitive market. As a result of this freedom and the fierce competition many business enterprises grew into the complicated and large organizations found in 1929, when the economic collapse started. Unbridled competition was a major contributor to the death of trade.

It is doubtful if the economic and social welfare of the nation calls for artificial restrictions or limitations upon the capacity of a business management to grow because, in time, survival will depend upon economic merit and efficient management and upon nothing else. But business itself should establish rules of the game so that growth and expansion will be sound and will not violate economic and social principles, while still giving free play to intelligence and initiative in management. It is also evident that free competition may lead to disaster if it is permitted to be uncontrolled and if it leads to practices that violate sound business principles and affect the national welfare injuriously. Competition must remain and size is not dangerous of itself, but controls must be instituted and sound policies and practices must be defined by business managements.

Not all business enterprises became large, but the smaller companies survived by the use of the principle of specialization. This usually took the form of an engineering business enterprise whereby the skilled personnel plus patent protection enabled profits to be made in competition with the large companies. Both the small and the large company, in addition, developed with a new industry that had an enormous market that required a minimum of demand creation or sales effort. There were many products and all could be sold, and the method of sale consisted largely of personalized selling for both specialty and mass production industrial products and sales by resale outlets for domestic products.

Conditions now encountered

With this background of development in practice and policy electrical manufacturers now face:

1. A sales volume 20 per cent of the 1929 value.
2. A factory productive capacity far in excess of the sales volume with large plants in fixed locations.
3. An organization with the number of employees, the departmentalization and the business methods suitable for past sales volumes and market conditions.
4. Hesitant and bargaining purchasers in contrast to the free spending buyers of 1929.
5. A steady decrease in financial resources and credit standing.
6. A marked decrease in the price of raw materials and an enormous decrease in the market value of past investments whether in plant, securities or employees.

Fig. 2—Distribution of 1929 sales in electrical machinery and apparatus (U. S. Census)

This is the background of present organizations at the time of the peak sales volume. Even at this time no knowledge was had as to costs and returns for the several agencies used in distribution, but the over-all returns on five times the present market volume gave very nominal profits.

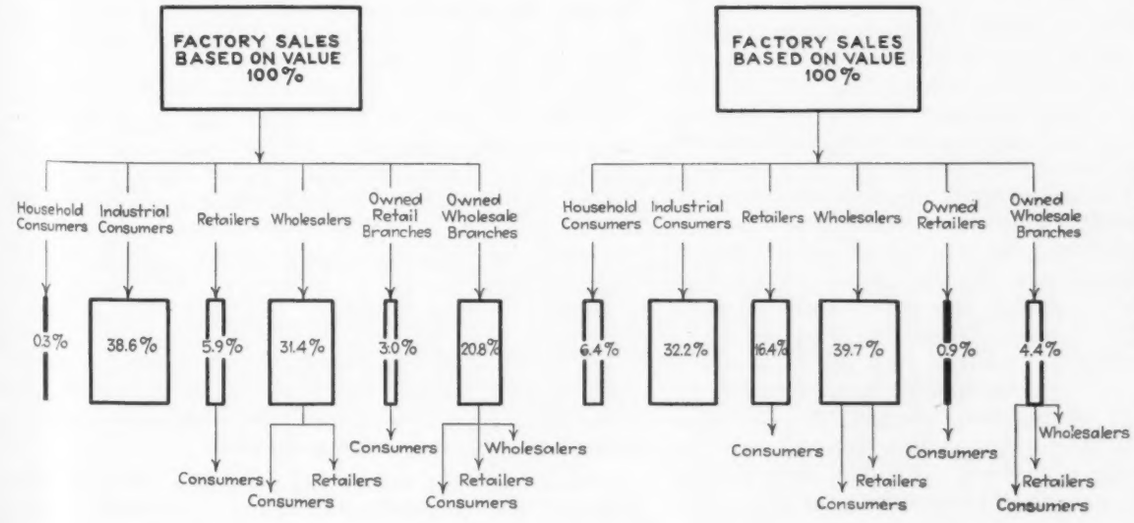


Fig. 3—Distribution of 1929 lighting equipment sales (U. S. Census)

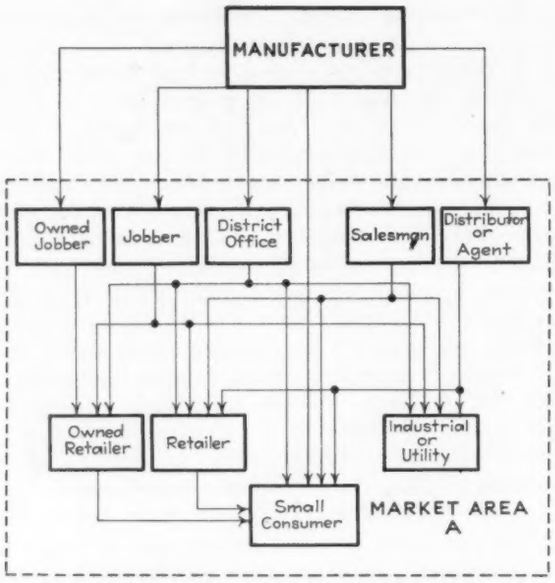


Fig. 4—Duplication and unco-ordination prevail in production and sales

In a typical market area the prevailing practice is to use several sales agencies, each controlled by a headquarters department of a manufacturer without co-ordination. There is a maximum of specialization in sales, a maximum of duplication in sales contacts and a minimum volume of business per sales agency. Cost accounting will show that, in the present markets, only from 10 to 15 per cent of the accounts of district office, jobber and dealer are profitable and that sales time spent on non-profitable accounts is upward of 50 per cent of total time spent in sales. In addition to complexity there is no control to secure selective marketing and multiple selling. Office leases, warehouses and clerical costs add to the uneconomical burden of this kind of distribution. No one makes money and no mere skeletonization of staffs will turn losses into profits.

7. Operating costs out of proportion to income from sales and investments.

8. Fixed capital charges on idle and often obsolete plants and manufacturing equipment.

9. A growth of competitors, in the form of small business enterprises in local markets, that take advantage of present manufacturing and marketing conditions.

10. No effective patent or legal protection against competition in mass production products.

11. A complex distribution system between factory and ultimate consumers, with costly duplications and an extreme application of the principle of specialization and concentration.

12. A continued decrease in sales volume, some obsolete and some new markets, a steadily decreasing net worth and working capital and a balance sheet record of deficits instead of net profits.

It is unnecessary to outline conditions in the electrical manufacturing business in more detail, for these conditions are common to all manufacturing and the individual enterprises find ample detail in their own business activities. The general situation is typical of the cyclic operation of business. The business tide ebbs and flows and business success depends upon alertness, competency and flexibility to meet these ever-changing, extremely complicated and unforeseen tidal changes. The present low tide has stranded American business, which waits more or less inertly for an incoming flood tide to set it afloat again. When will it arrive? This is the chief concern of business, and yet we doubt if we will recognize it when it does arise because the present economic storms have changed the landscape permanently and the next flood tide will not leave the same marks on the old shores. We shall have another "new era" in business, but no one can predict its character or state when it will occur. All that may be done is to face present facts, measure present trends and attempt to build business to meet the new conditions. And as we rebuild we must tear down.

Start again from scratch

The best principle to apply to present conditions is embodied in the question: If we start over in this business what will we do? An intelligent answer to this question, together with an unprejudiced and factual study of market conditions, will enable an intelligent business management to make a new start along the road that leads to profits. It is necessary first to go to the markets and determine facts and conditions as they exist. Some of the questions that should be answered are as follows:

1. What is the market for my products and can I determine the rating and classification of the customers for each product?

2. Where are the customers located, in what numerical density do they occur in each locality and what is their buying capacity in terms of unit annual purchases.

3. What do these customers require in their purchases? As to products? As to sales and engineering service? As to values? As to credit?

4. What new products are needed by customers or could be sold and what old products are now obsolete or not in demand?

5. What methods for the creation of buying demand can now be used to best advantage?

6. What kind of business mechanism is needed to supply each class of buyer with each class of products most effectively and economically?

7. What is the present business mechanism used to supply the markets? How much duplication is there? How much waste? How much lack of functional definition and functional activity to sell the markets?

8. Where are the present production facilities for supplying the markets and are they properly located, of proper size and modern in manufacturing equipment and methods?

9. What is the present competitive situation in the markets? What is the condition of competitors as to credit, sales volume and business organization and methods?

10. If I were starting over in this type of business and with this market information how would I organize my business to make money and what business mechanism would I use? What would I do in association with other electrical manufacturers to increase our business efficiency and volume on a profitable scale?

In other words, the first step in profit making is a very detailed market survey on a selective, classified, geographical and product basis in terms of customer habits and desires. The object is to find what can be sold, how it can be sold and where it can be sold most profitably and in greatest volume. The second step is to study the production and sales methods needed to sell the markets. This requires a study of plant location and size, a study of product as to type and performance, a study of how far to go with direct sales and how to use resale agencies. It necessitates the use of the selective marketing principle, the application of multiple selling as well as specialization selling and the modification of a general policy better to adapt it to each market area or product, and above all the institution of controls that will give flexibility to meet market changes and still make profits.

Open your own books

As a part of the process of profit building it is necessary for each manufacturer to analyze his own operations and find his own facts. Some typical questions to which answers should be had are as follows:

1. Many years ago, when I sold the present volume of business, what were my balance sheet figures as contrasted to those

of 1932? What are the differences in fixed and operating costs and why?

2. What products are now selling? In what volume? In what locations? What is the density of selling in terms of customers grouped as to volume of purchases in each location?

3. Of each dollar of operating income, what percentage is manufacturing cost, direct sales cost and overhead organization cost? Have I these costs allocated by market areas, by customer groups and by products so that I may fix selective and profitable controls of manufacturing and sales efforts?

4. Are my products such as fit buyers' needs? Could I add others to advantage? Do they conform to buyer conception of value and use?

5. What do I sell directly? Through resale channels? What is the sales efficiency of each method? How can I get more sales at less cost by changing the methods?

6. What proportion of my selling is through personal contact, direct mail, national advertising, through jobbers, dealers and other resale channels and what are the relative costs on a classified and selective marketing basis?

7. Are my factories properly located, efficient and economical in manufacturing equipment and operations and of the proper size?

8. How many factories, offices and warehouses have I? Where are they located? What do they cost? What does each return for the costs involved? How long do my leases run? What is the magnitude of transportation, warehousing and delivery costs?

6. Can I make a straight line and continuous contact with purchasers through a better organization, including the distribution mechanism? Can I consolidate sales agencies in each market area to get multiple selling of products by each salesman? Can I make a factory organization that gives, in principle, a general manager in control of production and marketing of a group of products instead of using specialized and unco-ordinated departments?

10. Am I concentrating and controlling my sales efforts on a multiple selling, selective marketing basis adapted to each market territory?

11. How can I help and control resale outlets and insure their doing a selective marketing job most effectively?

12. On the basis of the market data and market conditions and with the idea of building for the future, how should I reorganize my business to suffer a minimum immediate loss and yet get maximum volume and maximum profits out of the present volume of business in the shortest time?

Undoubtedly many manufacturers find themselves with too large a personnel, too many branch offices and warehouses, an incorrect factory condition, either as to size or location or both, too large an operating expense for the present sales volume and many inadequate, uneconomical and even obsolete conditions in production, distribution and organization. To be sure, leases and other expenses require time for liquidation, but surely at the end of three years many of these expenses could have been eliminated by intelligent management. Too frequently, however, business has made economies chiefly by reducing personnel, reducing sales expense, reducing advertising expense and by other quickly and easily made reductions that tend to skeletonize and do not eradicate the most uneconomical aspects of present business practices or organizations.

Many of them find, for example, that 75 cents of each sales dollar is manufacturing cost, 10 per cent direct sales, 10 per cent indirect sales and transportation costs and 10 per cent overhead costs, so that a loss is recorded. Effort is then made usually to reduce first the direct sales expense, then the indirect sales expense, and only under the pressure of dire necessity is an attempt made to reduce overhead and manufacturing costs, since a large proportion of these costs are considered fixed capital charges. Usually a flat reduction in direct and indirect sales expense is a false economy as it directly penalizes income-producing agencies. Only by the application of selective marketing and multiple selling principles based upon cost analyses can these costs be reduced intelligently and without injury to a business enterprise.

Conclusions

In general, electrical manufacturers, if they consider the markets and the conditions that exist and apply cost data from actual operations to present business, will find the road to profits lies in:

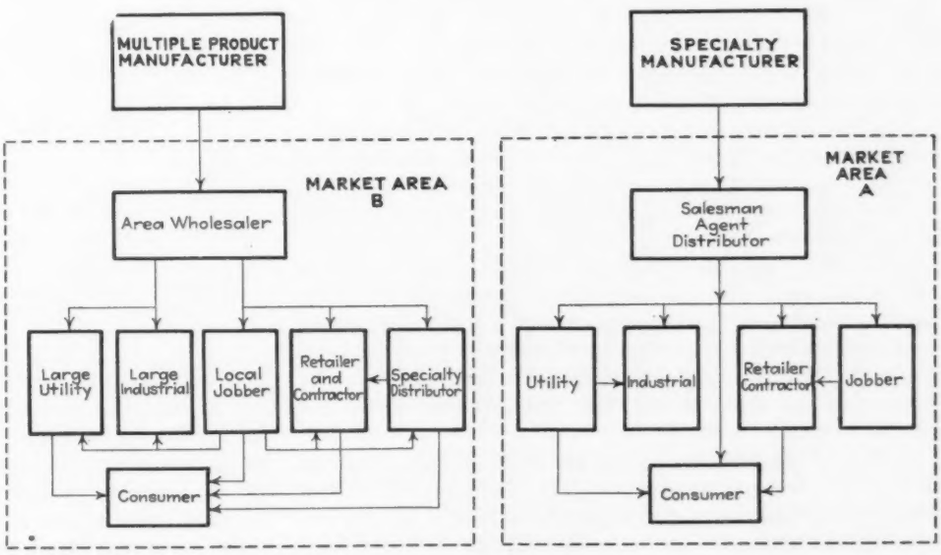
1. Modernization of factories and relocation of fac-

Fig. 6—Suggested simplification and control for engineering and specialty products

Many manufacturers make one or two products of a specialty or engineering character. With a low market volume these can afford direct personal selling in permanent locations in market areas only in special instances. Sales must largely be negotiated and conducted from headquarters. Cost accounting will show how far to go in directly contacting consumers and resale agencies in any market area on a selective marketing basis. These manufacturers compete with the large manufacturer of many products, including a competitive group of products, by reason of their ability to have greater specialization in sales, greater selectivity in sales and less continuous expense because they do not have a permanently located personal selling staff in market areas.

Fig. 5—Suggested simplification and control for distribution

A large manufacturer of multiple products should proceed, in principle, to consolidate and simplify the distribution mechanism in each logical market area. By applying selective marketing and selective selling on a cost accounting basis each resale agency and his sales would be controlled and defined as to profitable sales activities. The duplicated sales contacts would be eliminated, except as they are warranted, because the size of profitable accounts afford a multiple product sales contact. There must be a sufficient volume of business by all agencies at all times to keep them profitable, and the centralization of control permits direct sales aids from manufacturing headquarters when this is needed and is profitable.



tories to reduce manufacturing costs, reduce transportation and warehousing costs, speed up delivery and reduce non-productive factory overhead.

2. A consolidation of distribution facilities to get in each market area the principle of selective and classified marketing applied to both direct sales and resales.

3. A general decentralization and consolidation in the organization to reduce red tape, non-productive labor and time delays and to increase control of the functional activities by a responsible executive for each group of products. There exists a great waste in the extreme duplication of effort in manufacture and in sales and in the extreme departmentalization for engineering, sales, production and advertising by single products or markets instead of group products or markets.

4. A more general adoption of resale distribution and less personalized selling, except headquarters sales for large individual purchases as supplementary to local sales efforts. The time has passed for the national salesman, the district salesman, the jobber salesman and the dealer salesman to contact all accounts continuously in each local market. It is necessary to apply cost accounting and selective marketing principles to permit each type of selling to be developed for economy and volume in their respective realms of profitable activity. Each agency should handle business in its profitable groove.

5. As a final procedure in reorganization for profits each unit enterprise must work with similar enterprises in a trade association to develop facts and to institute controls and principles for their mutual benefit.

▼ ▼ ▼

Reactor-Rectifier Circuits Serve as Flasher and Dimmer

By C. G. SUITS
Research Laboratory, General Electric Company, Schenectady, N. Y.

Inherent time characteristics of saturable-core reactors an readily be employed in conjunction with tungsten lamps and oxide rectifiers not only to flash one lamp periodically (see ELECTRICAL WORLD, June 25, 1932, page 1008) but also to cause a chain of lamps to flash in sequence. In this arrangement each reactor acts as a variable impedance, dimming out its lamp until the voltage across the preceding lamp has risen as it is flashed on. The rectifier across that preceding lamp then gets enough more current to saturate the core of the succeeding reactor, reduce its impedance and flash the lamp in series with it. The first lamp meanwhile begins to dim under the influence of feed-back from the last lamp in the chain and the phenomenon becomes periodic and progressive, as shown in Fig. 1.

The time interval between full illumination of successive lamps can be from $\frac{1}{10}$ second to five seconds, with intervals of the order of $\frac{1}{3}$ second most easily and economically obtained. Flashing is hardly the term to apply to the lighting and extinguishing of the lamps. It more nearly follows the theater dimming control in its soft and pleasant gradation rather than abrupt progression as in the mechanical type of flasher.

Each load unit, whether it be a single lamp or group of lamps, requires a reactor and a rectifier and a ballast resistance or reactance. The circuit may be continued to any number of stages before the feed-back connection completes the cycle.

The virtue of the scheme rests in the fact that it is self-actuating. The reactors which provide the dimming are simultaneously the reactors which control the timing and thus no external control mechanism is required once the desired time characteristics have been obtained by proper adjustment of the electrical properties of the circuit elements.

Value of the scheme is not confined to sign flashing. It has possibilities in any instance where repetitive and progressive functioning of lights is wanted. Control of airport border lights, cyclic color lighting of fountains, architectural and colorama lighting are all possible fields of application. Separate sequence circuits can readily be synchronized even though they differ in number of units and in speeds of progression. An especial feature of all these applications is that the equipment has no moving parts to wear out or get out of adjustment, is noiseless in operation and creates no radio interference.

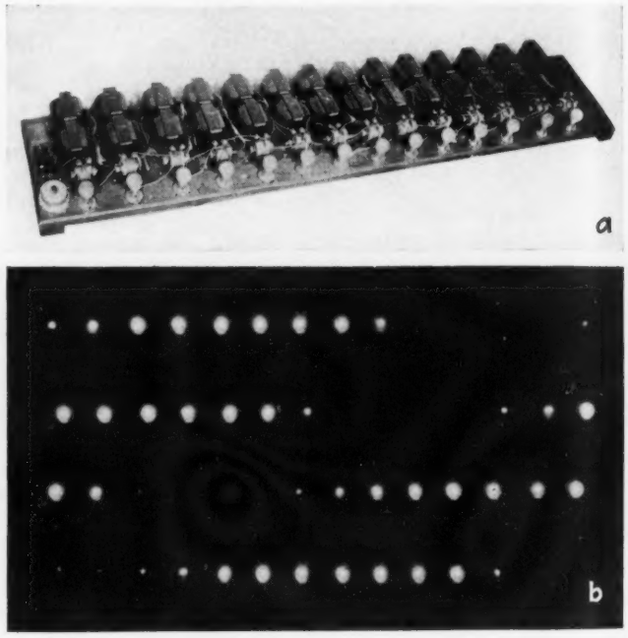


Fig. 1—Flashes without switch mechanism
(a) Laboratory set-up of reactors and rectifiers has inherent progressive timing characteristics which give the effect of
(b) Graded light intensity moving as shown in the successive exposures.

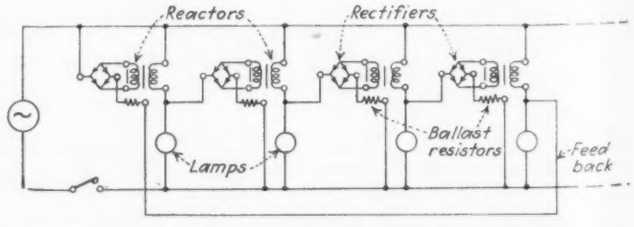


Fig. 2—Feed-back makes the cycle repetitive

Divergence of Opinion on Simplifying Home Service

THE article on "Simplifying Adequate Service to the Home," which appeared in the ELECTRICAL WORLD,* brought forth a diversity of response which may be presented by quoting comments from the electrical engineers of just three utility operating or holding companies which collectively serve about 2,500,000 domestic customers. While their viewpoints differ, they are unanimous on one thing—that there must be greater standardization of new-sequence meters (not all features or details), so different makes may be interchanged without changing all appurtenances and attachments with which they are used. This does not mean standardization to the point of impeding progress or new ideas or principles.

The comments from these three companies' engineers will be presented first and finally the answer of the author of the original article.

Company A—"I am inclined to agree that H. P. Sparkes, in his article, has made 'a well rounded-out attempt to solve some problems of utilities,' and that 'the outdoor detachable meter is especially adaptable to rural-line extensions, summer resorts, transiently occupied homes, and places difficult of access.' However, it seems to me that the author, especially in his introductory paragraphs, has been somewhat over-enthusiastic, although that may be excusable in an article of this kind, which seems obviously intended to force the reader out of the rut of conventional thinking on this problem.

"While the scheme as a whole is particularly adaptable to overhead services in rural and suburban territory, we have been following with a good deal of interest the various parts of the plan and considering their applicability to our own problem. It is unfortunate that the equipment for such a co-ordinated installation was not available several years ago when we were installing around 100,000 new meters every year.

"Full advantage cannot be taken of such a scheme unless one is willing to tie himself up exclusively to the devices of one manufacturer.

> **"It seems to me desirable, from an industry point of view, that all the manufacturers get together and agree on the necessary features of standardization to permit interchangeability, as they have done in the past with reference to the conventional types of meters and service equipment.**

"Looking ahead to the possibility of stroboscopic testing, all meters purchased by this company during the past two or three years have had marked disks and there are now some 120,000 such meters on the system. However, due to the different speeds of disk rotation, it would be impossible to use the same test set for the 80,000 X meters, the 30,000 Y meters and the 10,000 Z meters. Here is evidence of the need for standardization by manufacturers. Until practically all of our small meters, at least, are equipped with marked disks there can be no profit in this method of testing. We have found the cost of replacing the disk to be so high as to more than offset the possible economies of stroboscopic testing, and we have therefore suggested to the manufacturers that they develop some simple and inexpensive means of marking disks in the field without removing them from the meter.

"During the past two years there has been considerable development of the test set itself, and our suggestion that it be adapted to give the 'as-found' readings has been incorporated. This development, however, has not proceeded to a point where the set is commercially available.

"The use of circuit breakers on branch circuits is an excellent idea and should be encouraged.

"We have yet to devise a way of obtaining the advantages of outdoor metering in connection with underground services. Consequently with the curtailment of our overhead system there would be no permanent advantage in making outdoor meter installations in the relatively few cases involved during the next few years."

• • •

Company B—"This is of considerable interest and offers unlimited possibilities with reference to metering and circuit protection. However, there is an economic side that should be considered and I particularly refer to the use of circuit breakers. On systems that do not maintain customers' fuses it is exceedingly difficult to convince customers to pay an additional $5 to $10 on their wiring in order that breakers may be used.

"We firmly believe that circuit breakers are justifiable, in many instances, even at a slight additional cost either to the utility or to the customer, but the growth of this equipment is being seriously retarded by their increased cost over switches and fuses.

"The outdoor meter, as outlined in this article, has been on the market for some time, and while it possesses a large number of advantages the fact remains that it is not interchangeable with any other manufacturer's product, not even with other meters made by the same producer. To standardize, it would require that we use exclusively one make and type of meter. I am of the opinion that this would not be the proper economic step at this time, although

> **"I believe it may be possible for all the meter manufacturers to standardize on an outdoor type of meter that might offer possibilities.**

"Our present plan is to use a steel or aluminum box that completely incloses the meter, fitted with a test block or disconnect unit that permits us to disconnect or connect the service under our jurisdiction, and at the same

*October 15, 1932.

time providing suitable safety for the installers and testers. The box acts as double protection for the meter to prevent tampering through the glass or other means. Also, it provides additional protection in cases where climatic conditions are severe, such as seacoast towns or extreme temperatures. The test block is so arranged that, in making the test, interruption to the consumer is avoided.

"We believe that this type of device is more tamper-proof than the arrangement discussed and, most important, it permits us to use all of the meters that we have in stock in any of these installations.

"As to stroboscopic method of testing, there is a question in our minds whether this would be justifiable at this time in view of the fact that we have so few meters that are arranged for this method of testing. Companies that are using a large number of meters that are so arranged for this testing can undoubtedly make considerable savings not only in the meter shop but on periodic tests."

• • •

Company C—"The title of the article is intriguing and leads one to expect a discussion of a very important subject, but after reading the article it seems to me that the author has barely touched on what should properly be included under such a title. The material which one would expect to find would be a discussion on what could be done to open up the constriction that exists in so many cases between the distribution system and the customer's wiring or, in other words, the service.

"Therefore, the principal thing that should come into consideration would be a discussion of the ways in which an adequate service could be installed to take care of various heavy current-consuming domestic utilization devices, at the same time keeping in mind the desirability that such a service cost must be very nearly the same as, or only a very little more than, inadequate services which in so many cases are still being used. Such a discussion should, in the light of the above, be limited to what the proper wire sizes for such an entrance should be, what form this wiring should take, what constitutes an adequate service entrance protection device and what can be done to make such a service tamper-proof.

"The question of the meter under the subject heading which the author chose is secondary except for one important point, that is the method of installing it. From the early days of the industry until about five years ago the field struggled with all kinds, shapes and sizes of meters in an effort to fit them properly into the wiring scheme. About five years ago the size of the terminals of all American-made meters was standardized and this greatly simplified the installation problem. In this standardization, however, the old makeshift open-wiring terminal was retained and it was still necessary to chop holes in the ends of boxes and make other such improvised arrangements in order to install the meters.

"As far as the meter is concerned, the thing that is really needed now is a standardized universal meter designed for inclosed wiring, installation ahead of switches and fuses and which can be located indoors or outdoors without it becoming necessary to go to the expedient of using a mass of special devices and thinking up ways and means for fitting it properly into the wiring scheme.

"The demand for such a meter particularly requires that the manufacturer provide a standard base or inclosure so that all meters are interchangeable and can easily be installed or removed. This standardization does not require any changes in the inherent designs of the various meters, but has to do only with the method of coupling and the outline base dimensions.

"The meter discussed is one manufacturer's answer to the long-felt demand for a universal meter. As a device it has considerable merit and is probably the best offered by any of the manufacturers to date. The objections to the meter are mostly unimportant or can be overcome. There is, however, one serious objection to this development. The meter is not standard and adds one more special device to that conglomerate mass already in service. The meters which are being considered and probably will be offered by the other manufacturers will, unless the manufacturers get together, have the same objection.

"It is high time that the various manufacturers give a little attention to the real need of the purchasers, which, in this particular case, is standardization.

"The two other developments which are discussed in his article, namely, domestic circuit breakers and the stroboscopic meter tester, have very little place in a discussion embraced within the title which the author chose. While development of domestic circuit breakers does eliminate the necessity for re-fusing and is no doubt a convenience and so offers several advantages, it is, however, not an indispensable necessity for providing an adequate service. In fact, it has a decided disadvantage, and that is, it adds considerable to the cost. Its development does not fill a loudly expressed need. Stroboscopic meter testing is a controversial subject.

"In my opinion this article is a description of one company's developments rather than the outline of any plan for simplification of the service entrance and therefore fails to meet the expectations aroused by the title chosen. A discussion of the true subject material which properly belongs under such a title would, I believe, be of more interest than the present article."

Replies to comments

Replying to these comments the author of the article discussed has submitted the following:

"I heartily agree that a standard base should be presented to the market and is the thing of prime importance at this time. The problem is now under discussion among manufacturers, but we cannot give a decisive answer until all manufacturers are willing to accept the detachable meter with its advantages. The writer's company is open to any suggestions and solicits the assistance of the operating companies in arriving at a definite answer.

"Reply to Company C—While my article was entirely too short to cover thoroughly all the subjects mentioned by company C, I believe that rereading will show the topics have not been neglected and were really the basis of the plan proposed. It was my feeling that sufficient interest could be stirred up to have the associated efforts of both manufacturer and utility combined to the extent that the service problem could be answered. A meter manufacturer or utility separately cannot adequately solve this problem. It requires joint action of both groups. It would take many articles to bring out all of the points.

"The comment that the meter art seriously lags behind modern methods of conduit construction is highly recognized, but I believe the detachable meter with its associated apparatus is a step in the right direction of uniform constructions so far as the meter and switch on a service are concerned. This construction using conduit fittings is absolutely essential to protection against diversion of energy, around which the new sequence of meter connection was designed.

"It was recognized several years ago that the method of connecting a meter had been allowed to drift in the direction of the old form of open wiring in that boxes, knick-knacks and accessories were required to cover this up. It was with this thought that the detachable meter, with its conduit connections, was brought out to start something and pioneer the road. We will never get anywhere unless some one starts something, and the one starting to pioneer this road should be broad enough to accept outside assistance in arriving at a new standard. It would be ideal if all meters were of a similar construction, whether it be an exact duplicate of the detachable meter or a modification thereof. Any suggestions to assist standardization will be welcome.

"The comment (company C, paragraph 8) questioning stroboscopic testing and other accessories can be argued on the grounds that any system or change from the present conditions would have its auxiliary equipment, which would have to be taken into consideration. Therefore, I cannot exactly agree with the argument, in that any system cannot stand alone as a single piece of apparatus. It must be universal and have the necessary facilities for bettering the complete situation.

"Being a member of a manufacturing concern, the author naturally hesitates to express his opinion on subjects belonging primarily to the utilities, for fear of setting up a precedent against operating conditions, hence the last comment from company C is not answered.

• • •

"Reply to Company A—Regarding the comment that the article in question was "somewhat over-enthusiastic," I wish to point out that starting in 1900 to 1905 meter installations averaged approximately 200,000 meters per year. From 1905 to 1910 this average grew to 600,000, from 1910 to 1915 the rate was approximately 1,200,000, from 1915 to 1920 approximately 1,400,000. Utilities have taken the normal life of a meter to be 23 years; the actual life we might consider as being twenty years.

"At the above rates, therefore, the meters installed during the periods mentioned are becoming obsolete, with only a few years left to replace them with new, up-to-date equipment, such as the outdoor theft-proof meter plus approximately $1,000,000 development put in the metering art in 1924. It seems to me that utilities should get over-enthusiastic about replacements being made with the most up-to-date and modern apparatus as they are building for a twenty-year program.

"This is brought out very well by comparing A's comment in the second paragraph. I agree that it *is* too bad that this system was not developed prior to the installation of all these meters.

"Considering stroboscopic testing, a common denominator was selected for marks on the disks and it is hoped that within the next year a marking device will be on the market so that old meters may be marked with sufficient lines at minimum expense. The present meters are marked with the number of lines by a common denominator of practically all meters. Of course, it is realized that to replace the disk is entirely too expensive, but considering the fact that the electrical art is practically 32 years old as far as meters are concerned, a large portion of meters will have to be replaced within the next three or four years anyway. This means that these meters will be brought up to date and we will gradually arrive at an ideal stroboscopic situation.

"The enthusiasm back of the article is to build for the next twenty years.

"The latest development of the stroboscopic units provide for 'as-found tests' and the commercial unit is on the market at this time, available in small quantities.

"It is realized that the outdoor detachable meter will have to be developed for underground services, as many difficulties confront underground service. Where the service enters the building in the basement you cannot logically mount the meter outside. However, it is felt that with sufficient study on the part of the operating men an answer will be forthcoming.

• • •

"Reply to Company B—No comment will be offered on the opening remarks from company B as these are the subject of general discussion through operating channels.

"Regarding safety, that is provided in the detachable meter through the plug-in scheme. This automatically disconnects the meter from unfused service mains, yet provides a secure means for testing, not subject to tampering. Of course, there are many opinions on the subject of safety and I hesitate to comment further.

"The practice mentioned by the representative of company B in his fourth paragraph takes care of the transition period for utilities which have meters that cannot be scrapped and where it is not economical to make a further financial investment in the apparatus. But for new or replacement installations, the economy of a single meter or a meter plus a box can be argued from both sides. The type of outdoor meter discussed by the author has been tested for a number of years in seacoast towns, etc., and no difficulties have shown up."

CONCLUSION—This discussion represents what is believed to be a cross-section of utility attitude on one proposal for solving adequate service to domestic customers and a manufacturer's reply. Both groups recognize the importance of standardization, and so far as the manufacturer represented is concerned it is open to utility suggestions on the form which standardization should take. But the manufacturer emphasizes that the desired standardization cannot be effected by utilities and manufacturers negotiating separately. It is a joint problem of utilities and manufacturers as a whole. It is encouraging to note that the meter manufacturers and the utilities are now moving toward uniformity of design—[EDITORS.]

Getting under the wire at 9 a.m. for free range wiring privilege

Ranges Rented to Spur Hartford's Range Sales

CONVINCED that the route to range sales is by the path of range rentals the Hartford Electric Light Company is celebrating its fiftieth anniversary by inaugurating a range-rental campaign with free installation to the first 500 applicants. In the first ten days of the campaign it induced 516 applications for rental. This is nearly twice the average number of sales made per year in the past by both company and dealers combined. Range saturation was at 3,300 when the campaign began and it is confidently expected to increase this by at least 1,000 before the end of this year. Half the bogey was erased by the free wiring offer which was a feature of the opening of the campaign. A waiting line on the opening morning showed the pulling power of the two-page news spread of the previous day.

Before the end of the second week 444 of the 516 applications had actually signed rental orders (see accompanying table). Of these the dealers have turned in 130. It looks as if the company were well on the way to duplicate the experience with water heater installations, which quadrupled when rental was instituted as an adjunct to straight selling. Sixteen range sales were made by dealers (more than they made in the preceding three months) during the first four weeks after the range-rental campaign was launched.

In order that the rental program should have promise of full success in attaining the ultimate objective of enhanced range sales the following principles have dominated the program:

1. A single model must be selected as the *only* rented range. It must be simple but not severe in appearance. It must not be so beautiful as to leave customers permanently satisfied and thus confirm the rental habit.

2. It must be capable of rendering good technical performance in cookery.

3. It must not be identifiable with the line of any particular manufacturer, but nevertheless be a standard product, identified with the sponsoring utility.

4. The program must afford strong inducement to the dealers to participate in the rental compaign with full confidence that it will increase their direct sales.

5. The same allowance for wiring shall be made for rental and for sale, whether by dealer or by company. All the wiring cost to be borne by the company in the first 500 rentals or sales on the 50th anniversary offer.

6. Wiring contractors who are not dealers must also find an inducement to share in the rental campaign.

Tried on employees first

This whole program moved fast. On December 2, 1932, President Ferguson dropped a memo to Vice-President Cutler asking him to "select one single model of range, such as you consider most generally suitable, and determine an arbitrary low weekly rental price for employees only. The rental figure must be so low that it will be without question less in amount than are the economies to be effected by cooking with electricity at employees' rates." Four days later Mr. Cutler advised L. H. Knapp, sales manager, that the company had contracted for a supply of a new range to be called the "Hartford" range, to be rented to employees at 18 cents per week, wiring to be paid in part by the company and in part by installments from the employees. The offer prompted a wholly voluntary increase in employee range saturation from 30 to 42 per cent.

On January 30, 1933, the company launched its range-rental program for customers with the results already cited. In the meantime the company's service division,

Twelve Days to Effect 500 "Free-Wiring" Rental Orders

	February								
	1	2	3	4	6	7	8	9	10
East Hartford.....	8	8	11	14	15	16	16	17	17
Parkville.....	5	6	6	7	8	8	9	9	9
West Hartford.....	23	23	26	26	28	28	30	30	31
Windsor.....	6	7	7	10	12	12	12	12	12
Pearl Street.....	162	203	228	240	261	273	281	291	300
Dealer.....	0	22	46	60	86	104	123	132	136
Mail.....	10	11	11	11	11	11	11	11	11
Total.....	214	280	335	368	421	452	482	502	516
Total rental orders.	173	238	288	318	352	391	408	432	444
Rental installations.	...	...	9	30	50	62	65	66	...

The 72 who made application but hadn't signed rental orders were trying to decide whether to buy or rent a range.

in charge of H. L. Thomson, had had the opportunity to recommend to the manufacturer some thirteen changes in the design of the range to facilitate servicing and overhauling for reinstallation, without bringing the range back to the shop for the purpose. The rental price announced to the customers was 30 cents per week, payable monthly with the electric bill.

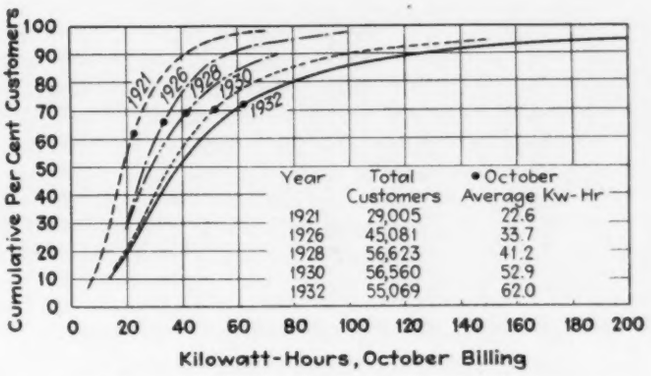
Something like 90 per cent of the range users will get their range energy at 3 cents under the following "partial domestic use" schedule:

1. Flat rate, 96 cents per year for each 100 sq.ft. of billing area payable monthly, plus
2. Meter rates per kilowatt-hour:
   4 cents for the first 2 kw.-hr. per 100 sq.ft. of billing area per month, and
   3 cents for all excess.

Details of the program as presented to the dealers and wiring contractors are to be set up in a "plan" circular. Some of the most pertinent provisions to be included are enumerated here to show how the program has been shaped to enlist their enthusiastic and profitable support. It should not be overlooked that the wiring business alone for the 500 installations represented by the initial "free-wiring" offer represents approximately $25,000 in volume for the wiring contractors.

Proposition attractive to dealer

The essence of the whole program is to insure dealer participation. Unless he ties in with the company's rental program half the advantage to him and to the company is lost. For him the rental plan constitutes an entrée to the lively prospect which could be made available to him only by more expensive drives on his part or by the company in his interest. That this virtue of the rental approach is sensed by the dealers is attested by the fact that some fifty rental installations have already been made in which a definite understanding exists that the customer is renting on a trial basis, with the privilege of buying as soon as convinced. The utility candidly expects the rentals to penetrate hundreds of homes that would not even try a range on demonstration because of the wiring obstacle and of the tacit obligation to buy. When renting they at least know what the trial will cost them for the privilege of satisfying themselves in an untrammeled way. There is no term set as to the duration of the rental period. This is another feature of advantage to the dealer. Also the company will supply the dealers periodically with lists of company rentals so that the dealer may work on these prospects for sales.



Half of Hartford's customers use more than 40 kw.-hr. per month

Promotional rate and intelligent load building has moved October domestic usage steadily "to the right." Average use increased from 22.6 to 62 kw.-hr. per month in twelve years. In 1921 55 per cent used 20 kw.-hr. or less per month, only 3 per cent using 60 or more. By 1932 the 55 per cent small users were consuming 43 kw.-hr. or less and there were 30 per cent using 60 kw.-hr. or more. The 55 per cent of small consumers had more than doubled their use and the number who were using 60 kw.-hr. (three times the previous norm of 20 kw.-hr.) had increased tenfold. The former 3 per cent of 60 kw.-hr. users are now replaced by a 3 per cent group who are using upward of 300 kw.-hr. per month. The rate was cut in two while these changes took place. But 72 per cent of customers still use less than the average, showing the continuance of a large potential market.

There are some twelve to fifteen dealers, including department stores, and 50 to 60 wiring contractors, some of whom are also dealers, working in the range territory. They were given the story verbally pending the preparation of the plan book. All the little details of phraseology have not been fully established, but enough is already crystallized to show the general character of the arrangements. It must be evident that the plan is simple and clear, otherwise the success already had in winning the dealers and contractors would not have been possible. But the dealers are all familiar with the plan book issued in 1932 which carried a schedule of wiring allowances for range wiring in connection with the drive then being made on sales.

Generous allowances for wiring

A somewhat similar schedule is being worked out for the present rental campaign to apply after the first 500 free installations. In the 1932 plan the largest amount collected by the dealer as part of his range price was $15; the rest of the wiring figure, up to $45, was paid by the company. The allowance depended upon whether the house was one-, two- or three-family, whether the company's existing service drop was adequate and whether the installation was to be made on the first, second or third floor. It applied equally to tenants or owners. The dealers have been assured that practically the same allowances will be made to cover range rentals which they or the company secure. As in the 1932 program, the allowances will be made only for installations off standard overhead lines, unwired apartment houses not being included.

Hartford's 6-kw. rental range

Flat top, full porcelain enamel, four plates (one a 2-kw. super-speed), porcelain lined oven-broiler, automatic oven control with pilot light, utility warming compartment.

Other provisions of the plan are as follows:

The company will try to turn all sales toward the dealer. Low wiring cost to the rental customer will enable the dealers to push a sale and, failing that, to effect a rental and get the range into service. In order to take care of patrons who have occasion to move the wiring allowance will be made for each move through 1933, whether the range be one sold or rented during 1933. If the dealer replaces with a sale a range installed on the fiftieth anniversary free-installation offer the company will move the range free of charge once during 1933.

If the customers call the company for emergency range trouble service on ranges rented through the dealer it will be given on the makes on the company's approved list on a labor-charge basis. During the first year's guarantee the manufacturer will furnish the material and the company will charge the dealer transportation and labor at $1.50 per hour. After the year guarantee expires the customer will be charged list price on materials, but there will be no charge for labor and transportation. This is the company's contribution to the cause of good service and co-operative relations with the dealers.

Load-building bonus to dealer and contractor

When the customer signs a rental order with the dealer it covers the customer's commitment for his share of the wiring cost, to be paid by him at the rate of $1 per month unless it exceeds $24, in which case he will pay it in 24 equal monthly installments. As soon as the order is accepted by the company and the range is installed (following credit approval and inspection of the premises) the dealer gets a $10 load-building bonus to cover his display and selling expense.

Dealers who are also wiring contractors will of course have priority on the wiring jobs for the rentals they turn in. If they prefer they can negotiate the wiring direct with the renter and collect from the company the company's contribution to the wiring cost. Wiring contractors who are not dealers will get a $5 load-building bonus for any rental orders they turn in to compensate them for any sales expense they may have had. They, too, can deal directly with the renter and collect the company's share of the wiring allowance from the company. For the first 500 installations made in accordance with the anniversary free-installation offer where the company absorbs all the wiring cost the contractor who turns in the rental order will also get the $5 load-building bonus.

Inasmuch as renting is viewed as an adjunct to sales, no part of the rental program is to be permitted to interfere with active selling. Where sales are made the dealers and contractors will install the wiring and bill the company in accordance with the table of wiring allowances. If desired, the company will finance range sales for dealers on the basis of a 10 per cent down payment followed by 24 monthly payments (not less than $5 per month) with interest at one-half of 1 per cent per month.

During the year there will be no let-down on advertising and sales promotion. Newspapers will have at least one company ad per week on the general theme of electric cookery. Dealers will be advised of the schedule and urged to tie in with it. Rental advertising will carry the names of authorized dealers. Folders sent by the company to likely prospects will also be supplied to the dealers for their use. The company will share with the dealers part of the cost of dealer advertising and will in addition assist them with window displays, home demonstrations and salesmen training. There will be co-operation with the dealers in special campaigns and there will be salesmen's bonuses to help perfect effective sales organizations.

Breaks the barrier to range sales

All the features of the program as they bear on relations with the customer, the dealer, the wiring contractor and the range manufacturer are summarized tersely in the following items set up by President Ferguson in commenting on the goal set for this new departure in load-building:

1. Our experience in selling ranges over a period of years shows the selling expense to be about $150 per range.
2. It is obvious that no dealer can work against this cost on the spread given by the manufacturer.
3. In effect, we have been asking the dealer (and ourselves) to do three jobs for the $50 to $60 spread:
   (a) Sell the idea of electric cooking.
   (b) Sell the house wiring.
   (c) Sell the range.
4. With (a) and (b) eliminated the spread should be sufficient for him to do (c).
5. We will offer a commission to him to do (b).
6. We will do (a) by a rental offer, we hope.
7. We look to a greater rather than a lesser sale of ranges, as our plans all contemplate and make easy the substitution of a sold range of proper size, color, etc., for the single type which we offer for rental (but not for sale).
8. Whether we succeed or fail in creating a range market, we cannot tell, but the fact is certain that there is no market of any magnitude at present.
9. In the experiment on our employees we found it opened a new field, both among those living in rented homes and among those of a lower income bracket, neither of which classes had been ready to make a plunge to the tune of a hundred or more dollars' obligation.

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Hydro-Electric Progress in Canada in 1932

Water-power development in Canada during 1932 was confined to undertakings already in course of construction at the beginning of the year. No new works of magnitude were initiated. Recent developments are described in some detail in the annual review of hydro-electric progress prepared by the Dominion Water Power and Hydrometric Bureau of the Department of the Interior. These resulted in the net addition of 378,923 hp., bringing the Dominion's total to 7,045,260 hp. Construction is also continuing upon several large undertakings which will increase the total in 1933 and subsequent years.

Most of the increase in capacity during 1932 was accounted for by three major developments. At the Beauharnois Light, Heat & Power Company's hydro-electric

development on the St. Lawrence River four 50,000-hp. units are now installed, giving a total capacity of 200,000 hp. The plant can accommodate additional units up to a total capacity of 500,000 hp., for which most of the foundations and embedded parts are in place. At Chats Falls on the Ottawa River the development which lies astride the inter-provincial boundary between Ontario and Quebec was brought to completion with an installed capacity of 224,000 hp. Four 28,000-hp. units were added in 1932. The Corra Linn plant on the Kootenay River was brought into operation, with an installed capacity of 57,000 hp. With the three other plants on the same river the West Kootenay Power & Light Company's total installed capacity is at present 226,000 hp.

A 220,000-volt line has been built by the Beauharnois company and the Hydro-Electric Power Commission of Ontario, carrying 25-cycle current from the station of the former to Chats Falls and thence to the Toronto-Leaside transformer station. Until July work was continued on a 330,000-hp. development on the lower Abitibi River. Progress continues on the Maclaren-Quebec Power Company's new 130,000-hp. development on Lievre River, to go into operation before next July. On the Shawinigan Water & Power Company 240,000-hp. Rapide Blanc development installation of units is expected within a few months.

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Balanced Relay Equalizes Material Input and Output

By H. VAN ROSEN

Electrical Engineer, Boston, Mass.

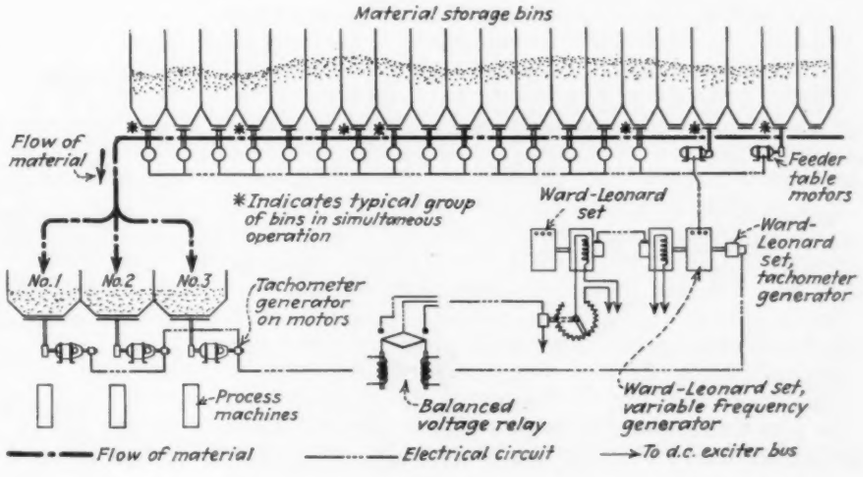
In an American industrial plant the problem of equalizing the flow of raw material from twenty storage bins containing seven kinds of material with the total discharge of the resulting mixture into three processing machines was solved by utilizing a balanced relay, motor-driven field rheostat, Ward-Leonard motor-generator set, variable frequency generator and tachometer generators, as shown in the schematic diagram.

The raw material is withdrawn from the bottom of each storage bin by a corresponding feeder table driven by a three-phase squirrel cage induction motor. It is deposited on a constant-speed conveyor belt system which routes the raw material through mixing machinery to three supply hoppers, one of which is located above each processing machine. From the bottoms of the hoppers the mixture is then withdrawn by revolving feeder tables driven by direct-current shunt motors. The amount of material deposited by any feeder table is directly proportional to its revolutions per minute. In order to regulate the flow of material from the storage bins to correspond with the demand for it on the processing machine side of the supply bins the automatic control apparatus had to be devised to vary the speed of the feeder tables under the storage bins in accordance with this demand.

All storage bin feeder table motors are supplied with three-phase energy from an alternator driven by a Ward-Leonard set. The direct-current generator field rheostat is motor-operated and the alternator shaft is fitted with a tachometer generator. By varying the direct-current voltage on the Ward-Leonard generator a variable frequency can be supplied to the storage bin motors, and in service it was found that these will start up with 12 cycles minimum and 60 cycles maximum, giving a speed range of 1 to 5.

On the shaft of each of the direct-current motors driving a supply hopper feeder table is mounted a tachometer generator. The armatures of these generators are connected in series, so that their integrated voltage is a function of the total speed of all three, and in turn of the total amount of material withdrawn. By connecting the three supply hopper tachometers to one coil of the balanced relay and the tachometer on the variable frequency alternator to the other coil it was possible to balance the material input and outgo automatically and instantaneously. The balanced relay actuates the motor-operated field rheostat on the Ward-Leonard generator; if the material output decreases the relay causes the variable frequency to be lowered, and vice versa. In case one processing machine shuts down, its tachometer voltage obviously drops to zero, and since only two-thirds voltage is then impressed on the balanced relay the frequency will be lowered to approximately 40 cycles.

A secondary advantage of this method of regulation is the maintenance of practically a constant level in the supply hoppers. This prevents drawing down the mixture to a funnel shape, which would cause segregation of the materials and destroy the homogeneity of the mixture. The conveyor speed is constant regardless of the amount of material deposited on the belts.



Scheme of relay and motor-generator arrangement to automatically control material flow

Gears and Motors Combine Into New Power Unit Type

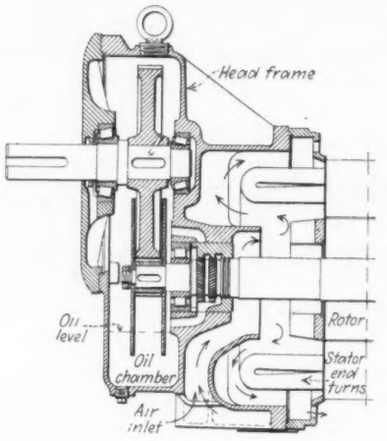
By P. C. DAY

The Falk Corporation, Milwaukee, Wis.

AFTER a long companionship in industry, during which each retained its separate individuality, the electric motor and the geared speed reducer have been integrated together into what is really a new type of power unit. This unit takes three characteristic forms, each of which has its particular virtues, but all three have the common attributes that they will allow a considerable economy in motor manufacture and will make motor drives extremely flexible in relation to power application speeds.

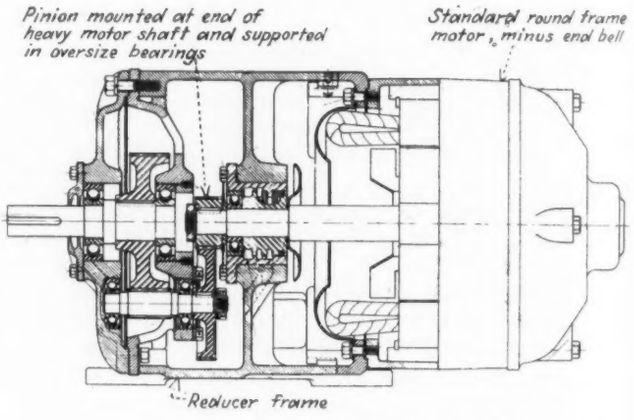
Let us consider the basic advantages first: General purpose motors are manufactured now in a large number of speed classifications and, generally speaking, the lower the speed the more expensive the motor. If it were possible for a motor user to buy only 1,800-r.p.m. motors for all his power applications he would save money at the present price differences between high- and low-speed motors. Now if a large majority of motor users could concentrate their motor purchases in the 1,800-r.p.m. class, then there would be even larger differences in price, because motor manufacturers would see production costs in that speed class go down on account of the volume of business in it. This is the promise of the new development and it does not seem unreasonable, because in practically every power application now the ultimate working speed of the driven machine is lower than the power application speed and some kind of speed reduction exists either between the motor and the driven machine or in the driven machine itself. So why not recognize this speed reduction for what it is and why not relate it closely, as logically it should be, to the driving motor?

Now, having identified the speed reduction means with the driving element, removing it as largely as possible from the driven mechanism, it becomes immediately apparent that the basic speed requirement of the driven mechanism can be completely fulfilled more economically by choice and arrangement of gears in the speed reduction means than it can by only partial fulfillment in this means and leaving part to be accomplished by choice of motor speed. Obviously it is not practicable to concentrate all speed change requirements of modern production machines into a single unit for each machine. Some of these speed changes must reside in the machine itself, as, for instance, in an automatic lathe in which the material being worked on has one operating speed and tool and handling movements may require many other speeds. But so far as the basic speed requirement of the machine is concerned, certainly it can be arrived at more economically by the use of a high-speed motor plus a reduction means than by the use of a low-speed motor also plus a reduction means. In other words, if a speed-reduction means of some kind is necessary, why not use



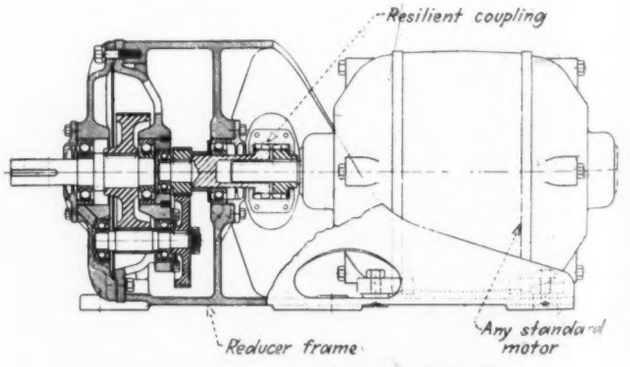
A type of "geared-head" motor

Within the capacity of the motor frame to withstand increased torsional stresses at lower final shaft speeds this development has much merit. It has the advantage of extreme compactness, the over-all dimensions of the whole device being not much greater than the motor alone.


Pinion mounted at end of heavy motor shaft and supported in oversize bearings
Standard round frame motor minus end bell
Reducer frame

Integral type of combination unit

The most compact and rigid way of combining gear reducer and standard motor. The reducer frame substitutes for the end bell of a round frame motor and the first pinion of the gear train is mounted on the motor shaft. This combination demands extremely accurate fitting together of motor and reducer.



Most flexible type of combination unit

Standard motor is mounted in reducer frame and motor and reducer shafts are connected by flexible coupling.

a high, rather than a low, speed motor with it and save the difference in motor costs?

There are other readily apparent advantages to this course. In case a drive is changed from one machine to another of different speed requirement the drive might be adapted to the new condition simply by a gear rather than a motor change. Also in a large industrial establishment great economy in maintenance and repair costs and in cost of stocking spare motors and parts could be obtained.

Development takes three forms

Of the three characteristic forms earlier mentioned in which this development shapes itself, one is the "geared-head" motor. Consider the variety of 60-cycle motors that have to be manufactured and kept in stock to cover the usual market range of speed and horsepower rating, say from "fractional" to 50 hp. Suppose that instead of making motors for all speeds (300, 360, 450, 514, 600, 720, 900, 1,200, 1,800 r.p.m.) in these sizes it were possible to concentrate on a single speed in each rating—1,800 r.p.m. For the lighter motors—fractional horsepower—it may be better to go to 3,600 r.p.m., but 1,800 is probably the highest practicable speed for heavy-duty service without unnecessary complication of the mechanical aspects. Then by incorporating simple pairs of gears in the head of the motor it becomes possible to concentrate production on one speed for all sizes of motors and to stock a few gear sizes to provide any other speeds. Within its range of usefulness this expedient is entirely practical.

The "geared-head" motor amounts, in effect, to a speed reducer built as a part of, or carried on, the motor frame. When the ratio of speed reduction goes any higher than, say, six to one, the torsional stresses on the motor frame are such as to rule out usual frame design. However, there is no reason why frame designs may not be revised and strengthened to withstand these stresses, but to do so would be to cancel much of the economy so far attained by standardization of frame dimensions. Also this must be essentially a development of the future.

The "geared-head" motor is, primarily, an economical substitute for a low-speed motor and its maximum useful gear ratio is about 9 to 1. This circumstance has an important bearing on the design of geared heads. Since the useful ratios are limited, the necessary dimensions of the geared attachment are never out of proportion to the motor and the multiplication of stresses is within the limits that can be safely carried by the motor feet. The overhang of the gear box is very little more than the length of the standard end bell and projecting shaft. Slow-speed motors, within the limits of volume production, are likely to be displaced in sale entirely by "geared-head" motors in the near future. The economical limit will probably lie around 50 hp. Beyond that limit lower motor production and higher relative gear cost will probably influence the retention of the slow-speed motor or the usual combination of motor and independent speed reducer.

Under present conditions of motors in manufacture, in stock and in use, a more reasonable procedure appears to be the development of the two other forms of the new type of power unit. These two forms differ from the "geared-head" motor in that instead of the motor carrying the speed reducer the reducer carries the motor. They might, in opposition to the other term, be called "motorized gear reducers." One of these forms consists of a gear box, adequately designed for the torsional strains imposed on it and which stands on its own feet. The end bell and the front bearing of the motor to be applied to it are removed and the motor shaft is carried between the regular rear-end bearing and a new bearing in the reducer frame. The first pinion of the reduction gear is carried on the motor shaft. Alignment of this pinion and shaft with the rest of the gears and shafts in the reducer is a matter of close limits in machine work; there is no room for adjustment.

The other of the forms of combination of reducer and motor is more flexible for it requires only the fixing of a standard motor in or on the reducer frame which supports it. The connection between motor and reducer shafts is made with a flexible coupling. This form appears to be capable of more immediately useful application than either the "geared-head" motor or the special combination of reducer and motor, since motors in stock and in the hands of users can very easily be combined into it.

Relative fields of application

Thus the "geared-head" motor of low ratio has a purpose of its own—it is not a competitor of the combined unit of motor and reducer nor of the separate motor and speed reducer. Its main object is to give greater production volume and economy to the high-speed motor and to eliminate the complication of many motor speeds. It is incorporated with the motor frame and requires no other support than the standard motor. Combinations of low-ratio speed reducers and high-speed motors have never been general; the competitive arrangement is the motor of medium speed with V-belt drive.

The combination unit is of higher ratio and begins where the "geared-head" motor reaches the limit of its usefulness. Its function is to give complete speed reduction between high-speed motor and industrial machine. Except in the smaller sizes, the reducer should support the motor. It is, essentially, a combination for light and medium industrial service.

When requirements exceed the range of stock production motors it is less expensive to use separate motors and speed reducers. The economic limit, for average ratios, lies around 50 hp. Combination units in their present and contemplated form are not suitable substitutes for motors and "speed reducers" in the heavier branches of industry, such as rolling mills, pulverizers and grinding mills, oil well pumping and drilling, reversing hoists, shaker conveyors or other services of unusual severity.

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How Leaks Run Up Costs*

Size of Opening, In.	Air: Cu.Ft. Wasted Monthly at 100 Lb. Pressure	Air: Cost Monthly at 10c. per M. Cu.Ft.	Steam: Pounds Wasted Monthly at 100 Lb. Pressure	Steam: Cost Monthly at 60c. per M Pounds	Water: Gallons Wasted Monthly at 40 Lb. Pressure	Water: Cost Monthly at 10c. per M Gallons
½	17,798,400	$1,779.84	805,000	$483.00	1,231,000	$123.10
⅜	9,979,200	997.92	460,000	276.00	692,400	69.24
¼	4,449,600	444.96	203,000	121.80	307,700	30.77
⅛	1,114,560	111.46	50,500	30.30	76,900	7.69
1/16	278,640	27.86	12,750	7.65	19,200	1.92
1/32	69,552	6.96	3,175	1.91	4,800	0.48

*This table was presented by W. E. Benninghoff, Cleveland Electric Illuminating Company, at a recent meeting of the Electrical Maintenance Engineers Association in the Electrical League of Cleveland.

Plymouth Collects Dividends from Power-Factor Improvement

Power-factor correction for an outlay of $8 per reactive kilovolt-ampere has recently been accomplished in the factory of the Plymouth Motor Car Corporation. And this cost is transformed into an actual profit in consideration of credits accumulated by the use of replaced equipment in other locations. Most conditions of poor power factor in industrial plants are caused by the use of too large motors. The startling correction in the Plymouth factory was made by surveying motor drives and by reducing motor sizes to the requirements of the driven machines.

There are about 3,000 motors in the Plymouth plant. Of them 704, totaling 1,710 hp., are concerned in the present discussion. These 704 motors are in the miscellaneous small parts, crankshaft and axle departments, which were attacked first because it appeared from conditions of operation that corrective efforts in these departments would yield greatest results. The 1,710 hp. was reduced 48.6 per cent to 878 hp. by changing 278 of the motors to smaller sizes. The equivalent corrective capacity realized by the motor changes was 391 rkva. and the cost was:

Labor	$1,566.91
Miscellaneous material	141.35
Twenty-nine new motors	1,421.29
Total	$3,129.55
Cost per rkva.	8.00

Motor changes were not made haphazardly. Load tests were made on each motor under the most unfavorable operating conditions; that is, with tools as dull as they are permitted to get before production and quality demand resharpening and with production at a normal heavy rate. Space does not permit the presentation of complete details of these load tests; let it suffice to say that 10-hp. motors were found with maximum possible loads of 5 hp. and other sizes in like degree of misapplication. Such conditions as were disclosed in these load tests are, of course, to be deprecated. But they are understandable when one considers that plant managements are more inclined to listen to machine designers and production superintendents (who insist that motors must be, as they think, large enough) than to electrical men who "babble" about power factor, angle of lag, magnetizing current and such incomprehensibilities. But managements later discover that these incomprehensible things have a very real effect on plant operating costs and steps are taken to cure them.

The outlay cost of $8 per rkva. does not represent the final figure for the power-factor correction job in the Plymouth plant. There are certain credits that transform this cost into a profit. The first credit is based on the reduction of capital investment in motors charged against the three departments affected. The capital value of the 278 motors that were changed was $14,059.45. The motors that replaced them are carried in the investment account at $4,199.76. The difference of $9,859.69 represents an investment decrease. In an industrial organization as large as the Chrysler group, in which the Plymouth Motor Car Corporation is included, the actual realization of this investment decrease is comparatively easy. The replaced motors were used in large numbers in other locations in the Plymouth plant itself and the remaining ones found almost waiting applications in other factories of the Chrysler group. Another credit is the improvement of motor operating efficiency, but this is not easily calculable, although it might amount to significant proportions on a capitalized basis.

Thus, in this particular case, power-factor correction has more than paid its way. An out-of-pocket cost of a little more than three thousand dollars resulted in an investment saving of nearly ten thousand. That, of itself, is profitable and puts the benefits of increased power factor in terms of improved operation and reduced energy cost into the class of pure velvet.

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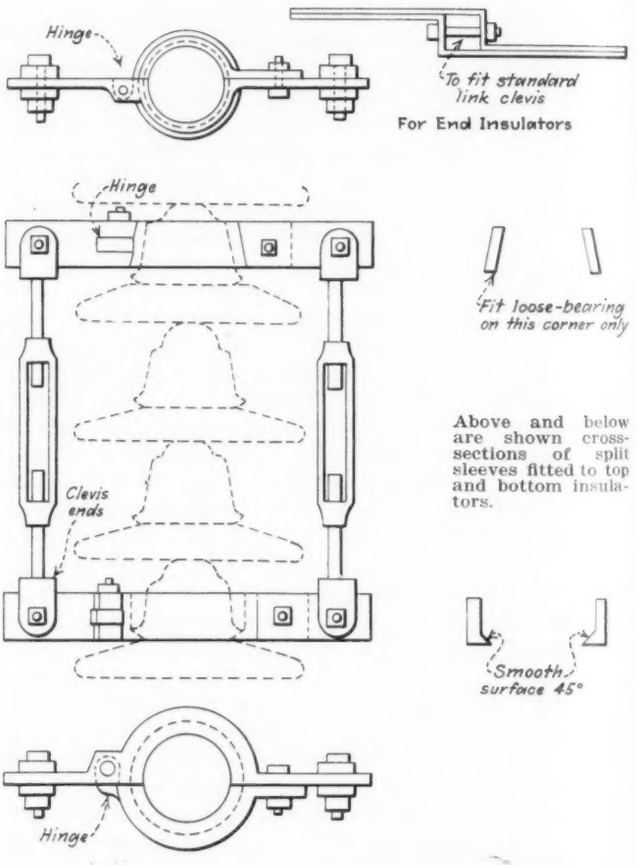
Insulator Changing Rig

By J. ELMER HOUSLEY
Alcoa, Tenn.


Hinge
To fit standard link clevis
For End Insulators
Hinge
Fit loose-bearing on this corner only
Above and below are shown cross-sections of split sleeves fitted to top and bottom insulators.
Clevis ends
Smooth surface 45°
Hinge

Here is a rig for quickly changing certain disk-type transmission-line insulators arranged in suspension or strain. Such a device may be carried easily where repairs must be made in mountainous country. It is easily constructed in the usual blacksmith and machine shops. A split collar encircles the insulator caps on the first and fourth insulators and the second and third disk in selected group may be relieved of tension by screwing up the turnbuckles. For end insulators a double-bar arm fits the standard link clevis and the bar may be substituted for one or the other of the collar type cross pieces. Obviously a rig of cross pieces of proper dimensions must be provided for each size of disk insulator.

Carrying Capacities at Fixed Voltage Drops

By W. W. McCULLOCH*
Distribution Engineering Department, Public Service Company of Colorado

Current-carrying capacities of three-wire and four-wire, three-phase rubber-covered conductors in conduit are given in the accompanying curves for the fixed voltage drops indicated that may be of value to contractors and engineers who install building wiring for light and power. The curves presented apply only to the voltages indicated (120 and 230) and for 80 per cent power factor. Curves have also been prepared for unity power factor which indicate that the smaller size circuits (Nos. 6-4) carry approximately 8 per cent more current at 80 per cent power factor than at unity power factor for the conditions indicated, but that the larger circuits (1,000,000 circ.mils, for example) carry 37 per cent less for a voltage drop of 3.5 and 59 per cent less for a voltage drop of 5 than at unity power factor.

These curves have been based on the requirements of the 1930 National Electrical Code as to conductor stranding, insulation thickness, braid and conduit size. These conditions have an important bearing on the conductor separation and consequently the impedance of the circuit.

Some slight variations exist in the over-all diameter of insulated conductors made by different manufacturers, so the calculations were based on the most consistent values. Inductances were calculated from H. B. Dwight's formulas, the conductor separation being assumed to be average between the minimum and maximum symmetrical spacing obtainable within the conduit required.

Although calculated values did not fall on smooth curves, due to the irregular steps in which conduit and over-all conductor sizes advance, the curves were smoothed out with modifications in the conservative direction. The voltage drops involved in the calculations were determined in somewhat the same manner used by L. C. Peterman on page 130 of the July 19, 1930, issue.

*Now connected with a southeastern utility.

Table I—Conduit Sizes Assumed in Calculating Carrying Capacities at Fixed Voltage Drop

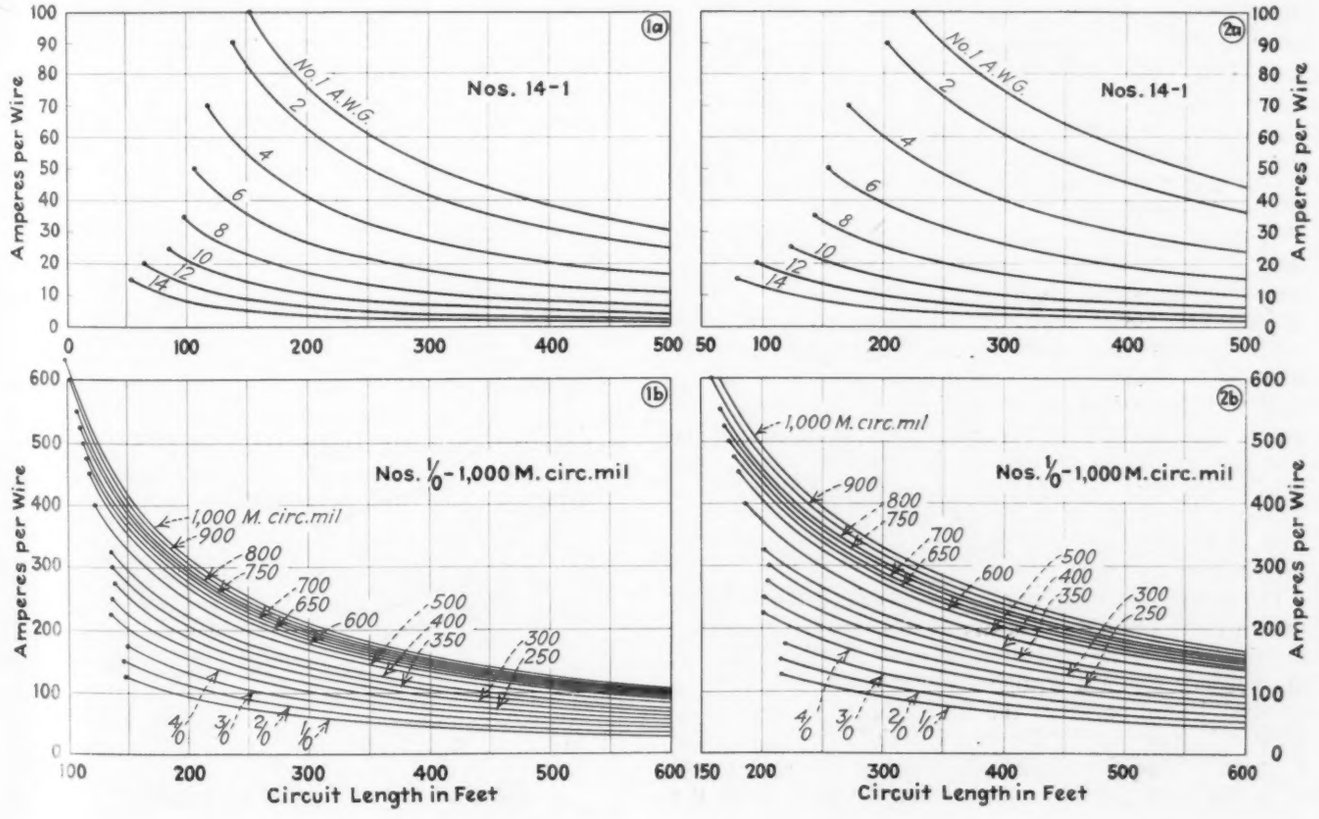
Based on rubber-covered cables in one conduit

Cable Size Strands	AWG*	Conduit Size (In.) 3 Conductors	Conduit Size (In.) 4 Conductors	Cable Size Strands	AWG*	Conduit Size (In.) 3 Conductors	Conduit Size (In.) 4 Conductors
Solid	14	½	¾		250	2½	3
	12	¾	¾		300	3	3
	10	¾	1	37	350	3	3½
	8	1	1		400	3	3½
					500	3	3½
	6	1¼	1¼				
7	4	1¼	1½				
	2	1½	1½		600	3½	4
					650	3½	4
	1	1½	2		700	3½	4½
	1/0	2	2	61	750	3½	4½
19	2/0	2	2½		800	4	4½
	3/0	2	2½		900	4	4½
	4/0	2½	2½		1,000	4	5

*Sizes 250-1,000 are in thousand circ.mils.

Figs. 1 a and b—Carrying capacity of 120-volt (phase-neutral) three-phase, four-wire, 60-cycle circuits at 80 per cent power factor and 2 volts drop
(See Table I)

Figs. 2 a and b—Carrying capacity of 230-volt, three-phase, three-wire, 60-cycle circuits at 80 per cent power factor and 5 volts drop
(See Table I)



Cost of Neglected Maintenance

By S. G. HIBBEN*
Westinghouse Lamp Company

Water cheaper than watts for lighting installations.
Economics of maintenance suggests double amount of light for present light bill.
Examples of lighting maintenance.

I WOULD say that if all our lighting installations and their immediate surroundings could be cleaned and reconditioned today, then the illumination that this nation would receive tonight would be well-nigh twice the amount that it enjoyed last night!

Where maintenance is poor and lighting systems depreciate the losses due to neglect may be roughly classified as follows:

1. Dirty lamps and accessories.
2. Darkened or discolored walls and ceilings.
3. Lamp bulbs of poor quality or low efficiency.
4. Empty sockets and unobserved burnouts.
5. Aged lamps past their prime of usefulness.
6. Under-voltage burning of lamps.
7. Improper combination of lamp and reflector.

Dirty Equipment—Many commonplace examples exist to demonstrate the importance of removing films of dust and grease from the lighting units. I recall, for example, the case of a "Glassteel" diffuser in a somewhat smoky machine shop that when new produced more than 12 foot-candles of illumination on the work bench beneath. It had so gradually got dirty after weeks of neglect that less than 3 foot-candles finally resulted, meaning that the cost of light on the work had quadrupled. It meant that out of every dollar spent for electric power and lamp bulbs 75 cents was being wasted.

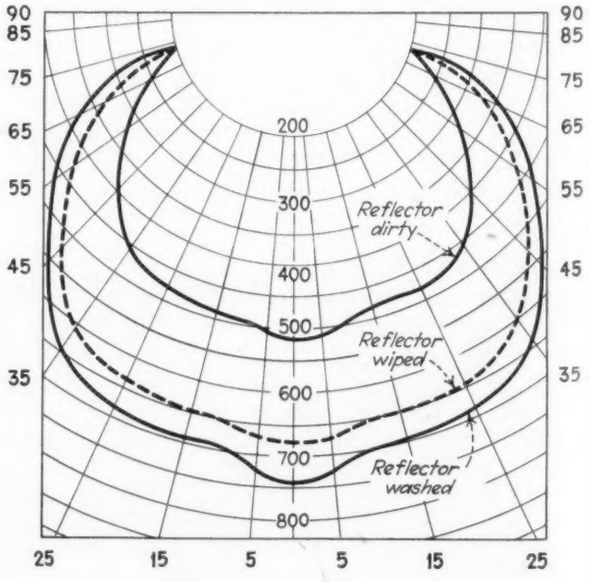
During the investigation of a certain large office building where the lighting units consisted of semi-indirect bowls that appeared from the floor to be perfectly clean I measured the average room illumination, then removed the glass bowl and washed it thoroughly, replaced it and found that the foot-candles were increased from 1.8 to 2.4, or 33 per cent.

A third not uncommon example may be taken from a building in Cleveland. The totally indirect lighting system after some two years of operation was the subject of dissatisfaction. Some 3.75 foot-candles were measured on the desk tops. First, the reflectors were thoroughly cleaned. The foot-candles were increased to 4.68, or a gain of 25 per cent. Since the lamp bulbs were visibly aged and dirty, new lamps were installed and the foot-candles moved up to 5.26, or a gain of 40 per cent. The ceiling was repainted from a yellowish cream to a lighter tint and the foot-candles grew to 6.78, or a total gain of 81 per cent. Examples of this sort multiply indefinitely.

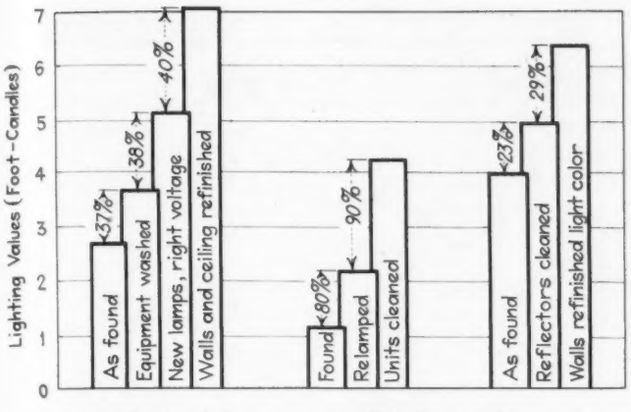
Of course one must expect a continuous depreciation due to the continuing deposits of dust on reflectors and the continual aging of lamps. However, this falling off in efficiency is not a straight-line function. Usually the greatest losses occur in the first month or six weeks. (Some 15 per cent in the first month is perhaps a fair average.) Dust deposited upon old dust is not so costly as is the first thin layer. The loss of light from the normal and unavoidable depreciation of the lamp bulb itself from internal blackening seldom brings the final output of that lamp below 90 per cent of its initial efficiency. However, blackening does continue as almost a straight-line slope and hence a very aged lamp bulb can economically be removed and replaced by a new one should it be found to live much beyond its rated life. Actually a decrease of about 3 per cent in the output efficiency of the lamp bulb will not infrequently amount to the equivalent cost of a new lamp itself!

Cleaning Costs—In any discussion of economics one naturally asks the question, "How should lighting equipment be cleaned and what does it cost?" In general the experience of past years has shown that bulbs and reflectors should be wiped free of dust at least once each month. Except in unusually dirty locations they should be washed at least once every 60 days. It is not a bad plan to alternate dry and wet cleaning. In a typical office building the average janitor can remove the glassware from an overhead fixture, scrub, dry and replace it in from four to five minutes. Under such circumstances I have collected data in two large buildings showing that the complete cost of cleaning maintenance per visit varied roughly from 5 cents to 15 cents.

Looking at the problem in another way, consider the



Effect of dirty reflectors very marked



Results obtained from proper lighting maintenance

office building where the annual electric power costs were some $8,770. The cost of lamp bulbs and the insertion thereof was about $1,035, while the annual total cost of lighting equipment maintenance (including breakage) and supervision was some $4,600.

Stubborn cases of encrusted, greasy dirt require warm water and soap or a mild grease solvent. Extreme cases of hardened sooty deposits, particularly on surfaces outdoors, may require a dilute solution of oxalic acid. After the common washing with soapy water, and to avoid the soap film that will hold the next deposit of dust, wipe and dry the reflector carefully or preferably rinse in ammonia water.

Cleaning costs vary, but taken alone they seem to average in the neighborhod of 4 per cent of the total operating costs of a lighting installation. If, as seems evident, such cleaning will in itself increase the illumination 20 or 25 per cent, then the results pay for the expenditure four or five times.

Dirty Interior Surfaces—Individual studies must be made to ascertain how frequently an interior may be repainted, but it seems common practice to find it economical to wash most painted interiors once annually. How much the reflection coefficient may be increased by washing is impossible to answer definitely, but many studies indicate that an increase on the order of 10 per cent is not uncommon.

Washing interior surfaces is an art. One good method is to dampen thoroughly a rather large area with clean water, preferably sprayed on, and never apply a washing solution or the cleaning sponge directly on a dry surface. One suggested method is of interest, namely, to coat the freshly painted surface with a thin water-soluble material such as colorless starch. When after some considerable period this surface becomes dirty it may be easily dissolved away, leaving the painted surface in its original condition, since the dirt comes away with the starch.

Inferior Lamp Quality—Our third item of neglected maintenance has to do with lamps of poor quality. The cost of the lamp bulb is merely a small "down payment" on the cost of lighting. It usually represents less than 10 per cent of the total and a few cents difference in the cost of the bulb is really negligible, whereas a few per cent difference in output efficiency is vitally important. If we evaluate lighting costs properly we find that a deficiency of say 3 per cent in the lamp efficiency is about equal to the average first cost of the lamp. Hence inefficient lamps are not cheap at any cost, and if, as often happens, the poor lamp is easily 5 per cent less efficient than a reputable good one, then the purchaser thereof should really be given a bonus to compensate him for his lighting losses.

We have previously remarked that aged lamps in a properly maintained system should be removed even though still capable of burning. Happily, the American-made lamps of high standing infrequently blacken so seriously as to necessitate removal before burnout, but there are cases on record where lamps may live much beyond the heretofore designed 1,000 hours life and degenerate into electric heaters. They become like the hose nozzle that might gradually be allowed to have its orifice reduced in size and from which less and less water flows. Consequently the up-to-date user in many instances finds it economical to establish a periodic lamp replacement schedule. Lamps are removed from important locations before burnout and placed in less important sockets, or destroyed.

A moment's calculation will disclose the very slight cost of this perfection of service. For example, consider the 100-watt "Mazda" lamp which the reasonably large user will purchase for less than 30 cents. During its rated 1,000-hour life it will consume 100 kw.-hr. of energy, which at even such a low rate as 3 cents per kilowatt-hour will cost $3. A 10 per cent average loss of efficiency during such a burning time (say the second 1,000 hours) would be equivalent to 30 cents, or the cost of a new lamp.

Undervoltage—Another pocketbook problem in connection with the economics of maintenance is the undervoltage burning of the lamp. The general features of wiring and voltage have been discussed, but under our present consideration comes the matter of voltage as effected strictly by maintenance. To a minor degree, there may be some loss in voltage due to any corroded contacts throughout the system. To a greater degree, there is a voltage loss resulting from haphazardly extending or overloading branch circuits, a temptation that exists through practicing the false economy of saving a little copper at the cost of lumens. A recognized and inevitable voltage drop in even a good system is 2.5 volts. In the main this is counterbalanced by providing a slightly excess voltage at the service entrance of the distribution panel. The cost evaluated in units of light amounts to approximately a 3 per cent diminution of illumination for a 1 per cent drop in voltage. Consequently the highest economy dictates that there must be the closest possible agreement between the designed and rated voltage of the lamp and the actual socket voltage, or that the latter be not less than the former. By over-voltage burning, one gains light at the cost of life, but as lamp bulbs have been and are in general constantly decreasing in first cost, this feature of operating costs deserves much careful study.

The Combination of Lamp and Accessory—Finally, in our endeavor to strengthen each link, and to secure the most seeing ability for our dollar, we must direct our generated light to its point of usefulness. If the glass reflector be broken, the light is wasted sidewise, since the proper reflector usually increases the usable light from two to three times over that from the bare lamp. If the metal reflector becomes tarnished or bent much the same thing occurs. If—and this is an important point—the wrong size of lamp bulb be inserted in the reflector, then the emitted beam is changed and the combination loses effectiveness. For example, a 200-watt size of RLM reflector and corresponding wattage of lamp will emit

light with an output efficiency of about 70 per cent. If a 150-watt lamp be inserted in this same reflector the output efficiency drops to about 62 per cent. One of the best checks on this loss is a study of the proper reflector holder or of the socket position therein and to guard against the careless interchange of bulbs and accessories.

The whole secret of an efficient lighting installation after it has once been properly installed lies in planned periodic attention. Frequently illuminometer surveys are recommended in order to detect depreciation. Above all, the maintenance must be made the regular duty of a reliable employee who is given to appreciate the worth of his job. He should receive credit for doing a good job. Neglect that is quite common today has been proved to reduce the possible illumination by an estimated amount of easily one-third. Reasonable maintenance seems to cost much less than the value of the light gained thereby. The total lighting bill of the United States last year was perhaps one billion dollars. Adequate and intelligent maintenance, if it save one-third of our lighting costs or may add a corresponding amount to our usable illumination, may therefore be worth $300,000,000.

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Thyratron Simplifies Plant Load Totalizer

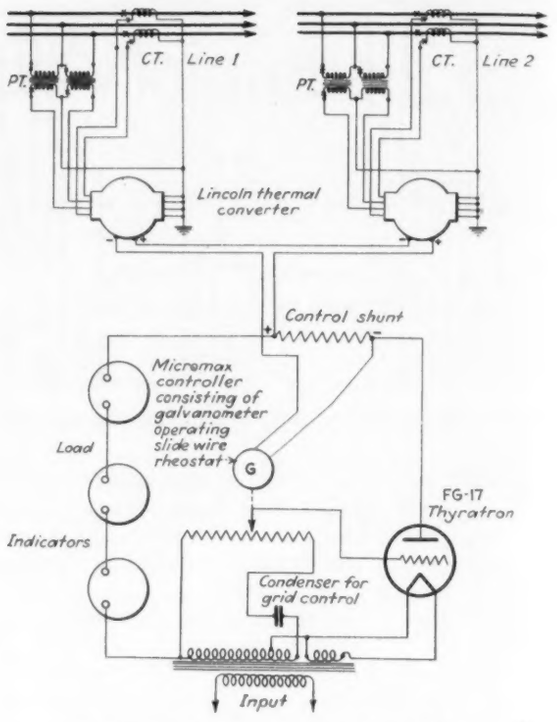
By HARRY HAMMOND

Meter Standardizing Laboratory, Detroit Edison Company

A "Thyratron" plant-load totalizer without any moving parts, except for a slide wire rheostat in combination with a galvanometer and the variously located indicators themselves, is apparently working out very successfully in the Marysville station of the Detroit Edison Company. Usual load totalizing schemes, it may be said, operate on principles of mechanical addition—that is, the summation of electrical impulses from intermittent contacts — and requiring electromagnets, dogs, ratchets, gears, etc., for their combination into a single result. All of these, with their problems of error and of maintenance, are missing from the new development at Marysville.

The operation of the device is extremely simple. The load indicators, in the boiler room, chief engineer's office or wherever located, are milliammeters, fitted with kilowatt scales. connected in series in the Thyratron plate circuit. Also in the plate circuit is a fixed resistance (control shunt on the diagram), the potential drop across which is balanced against the emf. of the thermopile in a Lincoln thermal converter. This emf. varies in direct ratio with the kilowatt load. The loads to be totalized are collected by connecting the thermopiles of the various converters in series.

When the *IR* drop of the control shunt, due to the series current in the plate circuit, is not equal to the emf. from the thermopiles of the Lincoln converters the galvanometer of the "Micromax" controller automatically manipulates a slide-wire rheostat. This rheostat controls the phase of the Thyratron grid and fixes the time of start of the plate current anywhere in the positive half cycle of the plate voltage. The average value of the plate current is thereby controlled for variation from



Scheme of Thyratron load totalizer

zero to maximum, corresponding to the loads on the thermal converters so the indicators show the plant load at all times.

Assuming the basic accuracy of the thermal converters, it will be noted that the only calibrated part of the apparatus is the resistance of the control shunt, against which the thermal emf. of the converters is balanced. This totalizer has been in use about three months and has required no service or maintenance whatever.

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Chart Saves Time in Estimating Underground Costs

By H. T. SEXTON

United Electric Light & Power Company, New York City

Where unit costs are available much saving in time can be effected in estimating costs per pull of secondary and primary main cables in underground ducts by incorporating the results of experience into a nomogram. The form of such a chart devised by the writer for the United Electric Light & Power Company is based on the linear character of the assembled costs for cable, for pulling and splicing labor, overhead charges, etc. The equation is of the type

$$Y = K_1 + a\ b\ k_2$$

where K_1 = labor for pulling and splicing, truck charges, etc., corrected for "overhead" percentages

a = length of pull in feet

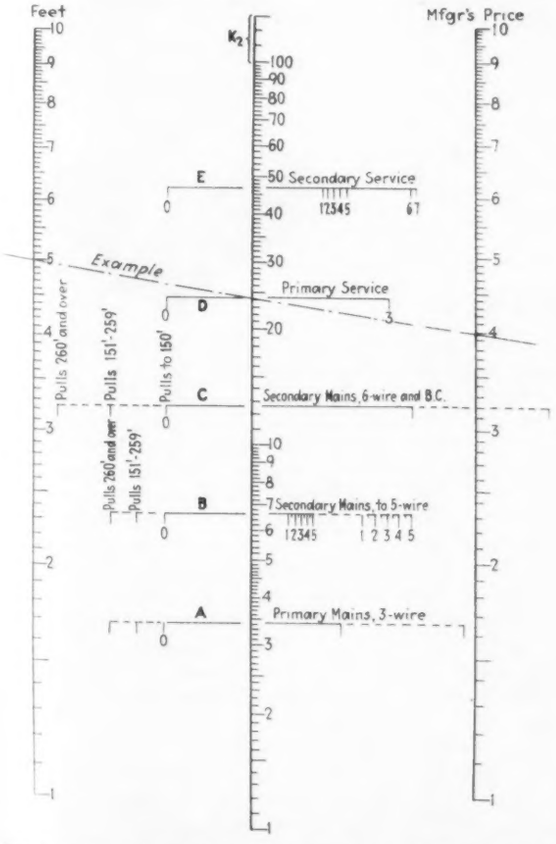
b = manufacturer's price for cables per duct foot

k_2 = factor for overhead charges on stock cable

The term $a\ b\ k_2$ is characteristic of three equidistant

and parallel logarithmic scales of equal length, one of which is for feet of duct and one for purchase cost of cable. The center scale is for the product and is shifted downward by the amount assigned to K_2; this multiplies for the overhead factor. There are also on the chart a group of horizontal scales, placed wherever convenient, to sum up the installation labor, trucking costs, overheads, etc., for each kind of service and the various numbers of "legs" of cable used for that service. It is convenient to use a scale of one millimeter per dollar on these scales so that the product found for cable cost on the vertical center scale can be added on a metric scale to the additional costs for installation plotted on the horizontal scales.

The horizontal scales have a common zero point which conforms to the average length of pull. If it is desired to adjust for longer pulls or for higher labor rates, etc., the zero point can be shifted to the left (or right). The principal scale markings on these horizontals are for a one-end splice. For splicing at both ends new scale markings can be extended to the right. Adjustment shifts on the horizontal scales from the normal condition are indicated on the dash line as shown on the chart.



Underground conductor costs derived from chart

Take as an example four cables in a secondary service duct 40 ft. long. Manufacturer's price 10 cents per foot or 40 cents per duct foot. Total length of pull is 50 ft. allowing 10 ft. for slack. Place straight edge, graduated in millimeters, on 40 on the right-hand scale and 50 on the left, reading $24 on the center scale. This is $24 ($24.20 to be exact) instead of $20 because of the overhead multiplier of 1.21. Next place the 24 millimeter index of the straight edge against the zero of the "Secondary Service" horizontal scale 1 and read $82, the required result, at point 4, corresponding to the four conductors to be pulled.

Hypothetical labor costs and percentages for overheads have been used in the construction of this chart. It is intended only to illustrate the method.

READERS' FORUM

Persistence Built $135,000 Cooking Load

To the Editor of the ELECTRICAL WORLD:

A recent survey of the commercial cooking, baking and allied heating loads, other than those classed as industrial heating, is of such interest to us that I am sending it to you for what it might be worth.

This survey shows that we have connected up as follows:

	Connected Load, Kw.
Eating places	2616
Bakeries	1484.4
Tourist camps	157.9
Tailor shops, boilers	134
Miscellaneous	53.1
Total connected load	4490.4

The estimated revenue for this load is $135,182 per year. We have connected to our line, including those classed as residential, 61,958 customers. The volume of this load was somewhat surprising to the writer, because it is very clear in his memory when load of this kind was first started that it was a very discouraging business at best in competition with cheap fuels and the general practice in their uses. The accumulated result speaks for itself and is due to continuous efforts on the part of our heavy-duty cooking specialists.

During times like these it is very evident that were we to let up in our efforts to sell and resell this type of load the loss would be very much faster than it accumulated.

LEWIS A. LEWIS,
Assistant General Manager.
Washington Water Power Company.

Avoiding Corrosion

To the Editor of the ELECTRICAL WORLD:

I note with interest that you ran a news item (February 18, 1933) on our use of electricity to protect gas pipe lines. We are cognizant of the corrosive nature of alkalies in contact with lead cable sheaths (ELECTRICAL WORLD of January 28, page 121), and this is taken into account locally when electric currents are applied on lead as well as steel systems to protect them from corrosion.

With steel or iron, the greater the negative potential the better the protection up to certain limits. Beyond these limits the potentials do no good for the moment, but they do no harm. On lead, however, slight negative potentials in the neighborhood of about 0.100 volt are desirable in order to counteract local galvanic currents, but higher potentials cause the deposition of bulky scales of alkali that have been reported as quite corrosive to the lead. Locally negative potentials are limited as far as practicable on the lead system to about 0.500 volt referred to a lead ground plate, but 0.200 of a volt would be a safer value. Negative potentials as high as 10.0 or more volts have been reported in some cities where the systems were not properly regulated.

R. J. KUHN,
Electrolysis Engineer.
New Orleans Public Service, Inc.,
New Orleans.

Men of the Industry

Lamme Medal Awarded to Edward Weston

The 1932 Lamme medal of the American Institute of Electrical Engineers has been awarded to Dr. Edward Weston, founder and at the present time chairman of the board of the Weston Electrical Instrument Corporation, "for his achievements in the development of electrical apparatus, especially in connection with precision measuring instruments," and will be presented at the summer convention of the Institute,

which is to be held in Chicago, June 26-30, 1933. Although best known as the founder of the science of accurate electrical measurements, Dr. Weston has been a poineer in many other branches of the electrical field and is distinguished as a scientist, engineer and versatile inventor. He was born in 1850, near Oswestry, Shropshire, England, and received his formal education in that country. From boyhood he was devoted to experiments in chemistry and electrometallurgy. On account of parental wishes, he studied medicine for three years, but his keen interest in electrical and mechanical investigations claimed his spare time.

He subsequently in this country began the study of dynamo electric machines and after extensive practical experience in this field filed his first application for a U. S. patent on dynamo construction in 1876, later receiving many patents in this field. From 1875 to 1886 he engaged in intensive development of both incandescent and arc lighting, doing notable work in the search for methods of making suitable incandescent filaments and arc light carbons.

In 1883 he decided to relinquish his other interests and devote all his time to the research and development necessary to produce accurate and convenient electrical instruments. He established the Weston Electrical Instrument Company, of which he was vice-president and general manager from 1888 to 1905, and president from 1905 to 1924, when he became chairman of the board, a position which he still holds.

Mr. Weston was a charter member of the American Institute of Electrical Engineers and served as president 1888-89.

His memberships in other scientific and engineering societies include: American Society of Mechanical Engineers, American Electrochemical Society, American Physical Society, American Chemical Society, Franklin Institute, and American Association for the Advancement of Science (fellow).

"In recognition of his distinguished services to mankind rendered in the field of pure and applied science" he was elected an honorary member of the Franklin Institute in 1924.

Other high honors received by Dr. Weston include the Perkin medal of the Chemists' Club, 1915, the Cresson medal of the Franklin Institute, 1910, and the Franklin medal, the highest award of that Institute, 1924.

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A. Jackson Marshall Resigns

A. Jackson Marshall after seventeen years of headquarters service with the National Electric Light Association, has filed with the liquidation committee his resignation from the office of secretary. Following several years of activity in the lighting industry on behalf of the Welsbach and Holophane companies he engaged for a time in illumination consulting work. Also in 1912 he became editor of *Good Lighting and the Illuminating Engineer*. Two years later he shifted his energies to the transportation field by becoming executive secretary of the Electric Vehicle Association. This was immediately after a brief connection with General Motors Truck Company in northern New Jersey territory.

When in 1916 the Electric Vehicle Association was absorbed into the National Electric Light Association Mr. Marshall functioned as the executive representative of the Commercial Section. At that time the commercial opportunities of the electrical industry were just beginning to be recognized and the rapidly widening scope of the activities of this section were primarily directed and inspired by Mr. Marshall. It was about ten years ago that Mr. Marshall assumed the duties of secretary.

P. B. McKee Named President of Portland Utilities

Paul B. McKee, president of the Emprezas Electricas Brasileiras, South America, has been elected president of the Pacific Power & Light Company, the Northwestern Electric Company and the Portland Gas & Coke Company to succeed Guy W. Talbot, who was forced to retire on account of ill health. He began his career in practical work with hydro-electric and other construction companies and spent a year in machinist's training at the Union Iron Works in San Francisco. In 1916 he became assistant to the president of the California-Oregon Power Company at Madison. Four years later he was made vice-president and general manager of

that company, a position which he held until September 1926.

Early in 1927 Mr. McKee accepted the presidency of the Emprezas Electricas Brasileiras, S. A., where he was also a member of the advisory board and directing head of 34 operating electric light and power, telephone, gas and street railway companies controlled by the Brazilian company. He will return to Brazil on March 18 to arrange for the transfer of his responsibilities there to his successor, Ramon Siaca.

GUY W. TALBOT, the retiring president of the Portland companies, retains his position on the board of directors of these companies and becomes chairman of the board of Portland Gas & Coke Company. His career, embracing 40 years, has been spent entirely in the railroad and public utility field. He had been identified with railroads in the Middle West and the Northwest when he became identified with a group that was organizing and building the Oregon Electric Railroad. On the sale of the railroad property, its organizers, among whom was S. Z. Mitchell of the Electric Bond & Share Company, entered the power and light field and thus Mr. Talbot was launched on his career of organizing and developing the companies he has since headed.